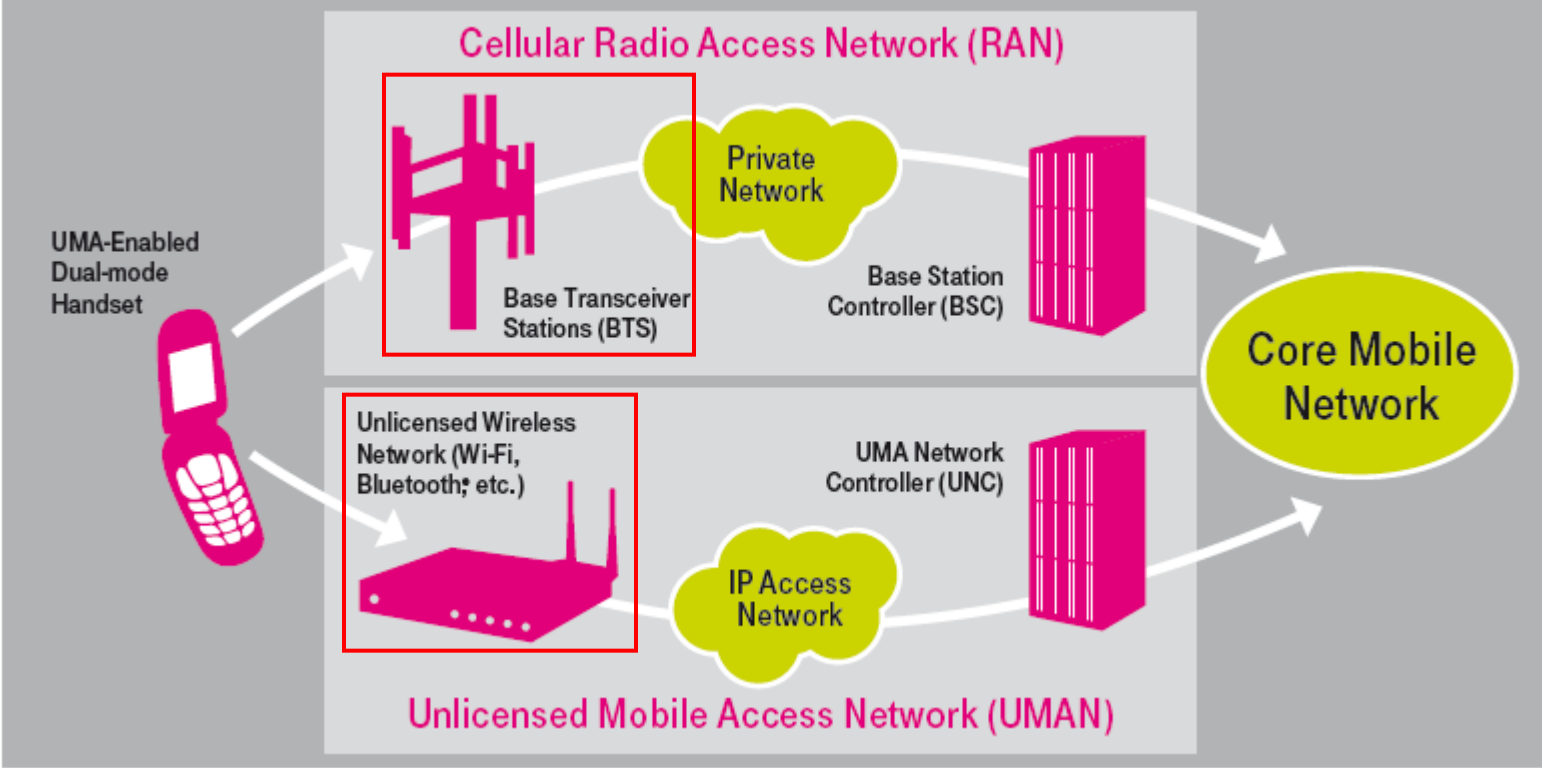


INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
1. A system including:	<p>Each combination having at least one item listed on Exhibit A, at least one item listed on Exhibit B, and at least one item listed on Exhibit C is a system (hereafter “Accused System”).</p> <p>For purposes of these infringement contentions, a wireless network comprises at least: (1) Radio Access Network comprising at least one base station controller, at least one transceiver, and at least one antenna; (2) a system of computers, the system of computers comprising computers associated with the at least one base station controller(s); computers functioning for network optimization, including at least computers implementing D-SON, C-SON); and, computers functioning for locating wireless devices; and, (3) one or more wireless devices.¹</p> <p>The exhibits and attachments are not included with this complaint as adequate notice is provided. The exhibits and attachments will accompany the infringement contentions. There is no requirement that each computer of the system of computers locates a UE.</p> <p>Because infringement liability is not dependent on ownership, e.g., use of a system can infringe (35 U.S.C. § 271), infringement is not dependent on ownership of all limitations of a claim.</p>
at least one radio-frequency transceiver and an associated at least one antenna to which the at least one radio-frequency transceiver is coupled,	<p>Plaintiff contends each item listed on Exhibit A corresponds to this claim limitation because each Exhibit-A item is a base station. Base stations include at least one radio-frequency transceiver designed and used in association with at least one antenna. When base-station transceivers and antennas are in communication, they are coupled. Further, in addition to being so coupled, the transceivers and antenna of each Exhibit-A item are also, by placement within a base station, physically coupled.</p> <p>The following exemplifies this limitation’s existence in Accused Systems:</p>

¹ A wireless device is considered within the wireless network when in RF communication. However, a processor of such wireless device may also be considered outside or inside the network.

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Claim 1	Corresponding Structure in Accused Systems
	 <p>The diagram illustrates a mobile network architecture. On the left, a 'UMA-Enabled Dual-mode Handset' is shown. Two arrows originate from the handset: one pointing to the 'Cellular Radio Access Network (RAN)' and another pointing to the 'Unlicensed Mobile Access Network (UMAN)'. The RAN section includes 'Base Transceiver Stations (BTS)' (represented by a red box around a tower icon) connected to a 'Private Network' (yellow cloud), which is then connected to a 'Base Station Controller (BSC)' (red server rack). The UMAN section includes an 'Unlicensed Wireless Network (Wi-Fi, Bluetooth, etc.)' (represented by a red box around a router icon) connected to an 'IP Access Network' (yellow cloud), which is then connected to a 'UMA Network Controller (UNC)' (red server rack). Both the BSC and the UNC have arrows pointing to a central 'Core Mobile Network' (yellow oval). The entire network structure is set against a light gray background.</p> <p>Attachment 4 (T-Mobile Wi-Fi Calling for Government (2009)) at 1.</p>


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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="378 272 1045 685" data-label="Diagram"> <p>A diagram illustrating wireless communication. On the left, a black tower labeled '4G' is enclosed in a red box. It has concentric pink circles around its top. A lightning bolt connects it to a pink smartphone in the center. Another lightning bolt connects the smartphone to a second black tower labeled '5G' on the right, which is also enclosed in a red box and has concentric pink circles around its top.</p> </div> <p data-bbox="378 706 1222 743">Attachment 5 (Journey to 5G –T-Mobile US Perspective) at 6.</p> <div data-bbox="388 763 917 1308" data-label="Diagram"> <p>A diagram titled 'Network Architecture' enclosed in a pink box. On the left, several icons represent different devices: a smartphone, a car with a Wi-Fi symbol, a person's head with a Wi-Fi symbol, and a computer monitor with a Wi-Fi symbol. Arrows from these devices point towards a central red antenna tower, which is enclosed in a red box. A double-lined arrow connects the antenna tower to a cloud icon on the right, which contains a server rack.</p> </div> <p data-bbox="378 1334 506 1372"><i>Id.</i> at 11.</p>

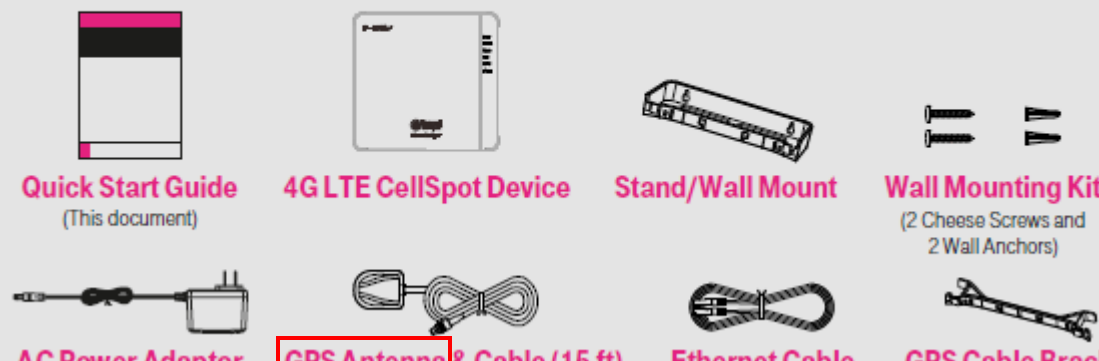
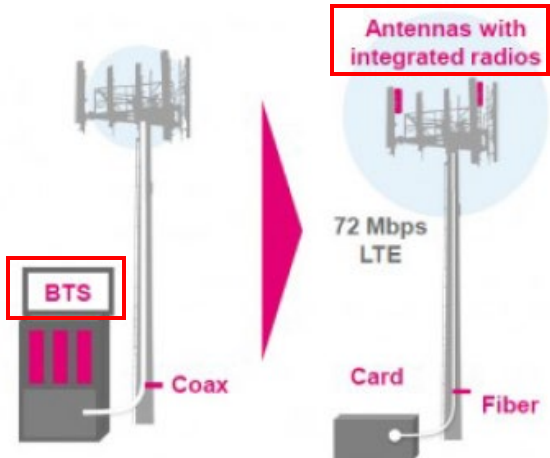
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<p>6. <u>Antenna Coax and BTS Grounding</u></p> <p><u>COAX:</u></p> <ul style="list-style-type: none"> a. Coaxial cable grounding shall typically be placed at the top (near bend to antenna) in the middle on vertical runs over 200 feet, at the bottom of the tower (near bend to ice bridge), and at the Antenna ground buss (AGB) outside the BTS or building at a minimum. b. The ground kit leads to the buss bars are to be straight with excess trimmed off prior to attachment. c. All ground leads are to be attached with two hole lugs and no corrosive goop (Noalox). <p><u>EQUIPMENT:</u></p> <ul style="list-style-type: none"> a. Tenant shall install a ground ring around their own equipment and tie grounds to the existing ground system in a minimum of two (2) locations. b. Tenant shall not disturb existing grounding (except as noted above). <p>Each antenna coaxial cable shall be grounded at three points using a coaxial cable kit from the manufacturer of the antenna cable (4 points if tower is over 200' and/or lamped).</p> <p>Attachment 6 (T-Mobile Towers Co-Location Construction Standards (2009)) at 21.</p>

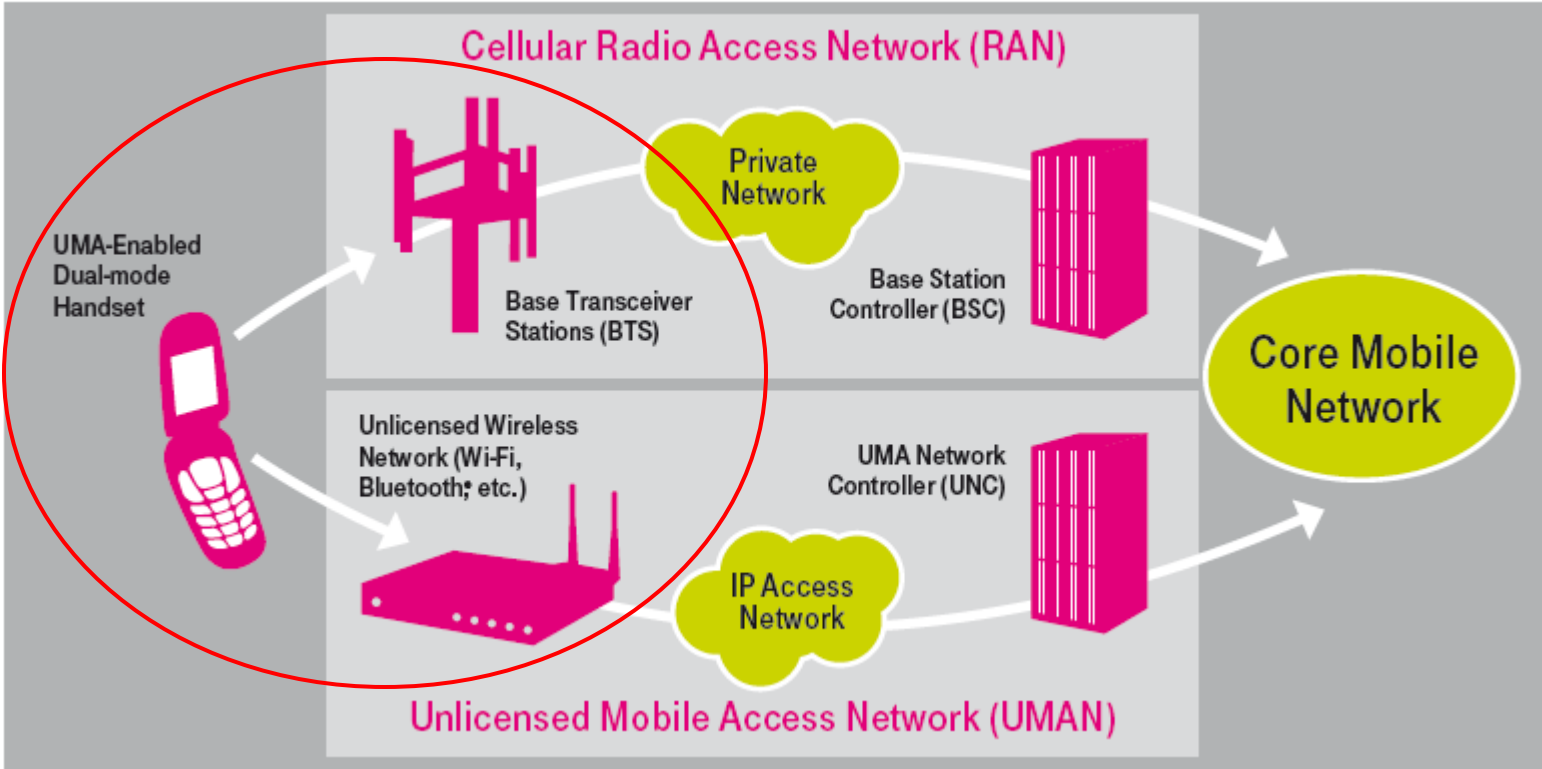
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="384 253 1488 532"> <p>4G LTE CellSpot® Quick Start Guide</p> <p>You now have a powerful, simple way to create your own personal T-Mobile 4G LTE mini-tower in your home or small business office. It can provide full bars indoor 4G LTE coverage, more dependable voice calls and more consistent data speeds.</p> </div> <div data-bbox="384 561 974 1205">  </div> <p data-bbox="384 1230 1276 1266">Attachment 7 (4G LTE CellSpot® Quick Start Guide (2015)) at 1.</p>

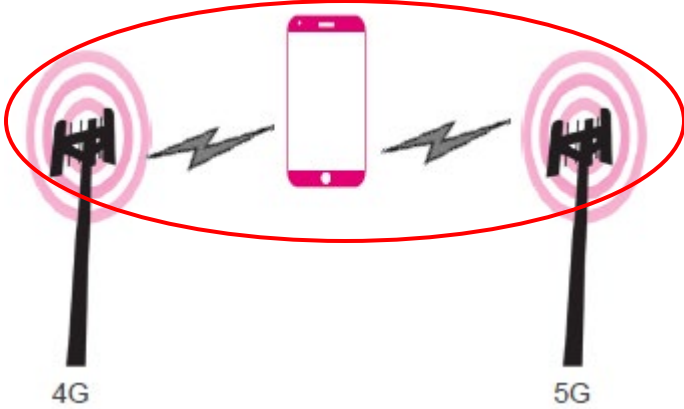
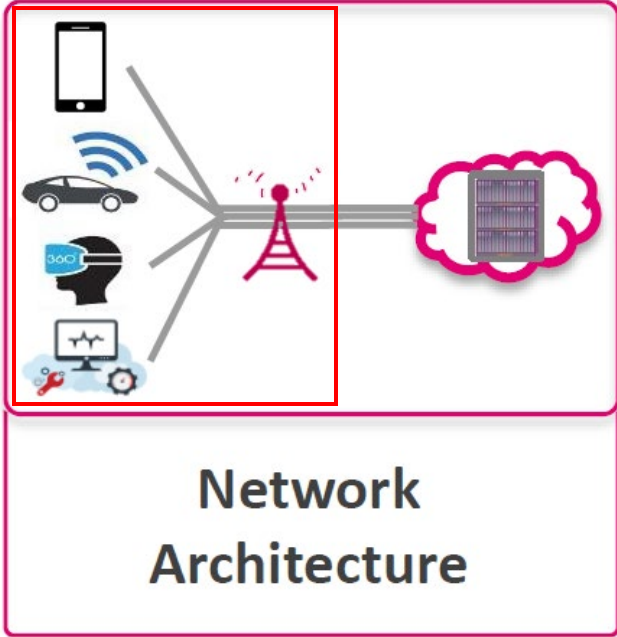
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="380 253 1646 773"> <h3 style="background-color: #e91e63; color: white; padding: 5px;">What's Inside</h3>  <p>Quick Start Guide (This document)</p> <p>4G LTE CellSpot Device</p> <p>Stand/Wall Mount</p> <p>Wall Mounting Kit (2 Cheese Screws and 2 Wall Anchors)</p> <p>AC Power Adaptor</p> <p>GPS Antenna & Cable (15 ft)</p> <p>Ethernet Cable</p> <p>GPS Cable Bracket</p> </div> <p><i>Id.</i> at 2.</p>  <p>BTS</p> <p>Coax</p> <p>Antennas with integrated radios</p> <p>72 Mbps LTE</p> <p>Card</p> <p>Fiber</p> <p>Attachment 3 (T-Mobile Announces LTE, Prepares To Take The US Wireless Market By Storm (Webpage, 2012)) at 2.</p>

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Claim 1	Corresponding Structure in Accused Systems
<p>wherein the at least one radio-frequency transceiver is configured for radio-frequency communication with at least one mobile wireless communications device; and</p>	<p>Plaintiff contends each item listed on Exhibit A corresponds to this claim limitation because each Exhibit-A item is a base station having a RF transceiver whose parameters have been configured for RF communication with mobile wireless communications devices (specifically one or more of the mobile wireless communications devices identified on Exhibit B). The following exemplifies this limitation's existence in Accused Systems:</p>  <p>The diagram illustrates two network architectures: the Cellular Radio Access Network (RAN) and the Unlicensed Mobile Access Network (UMAN). In the RAN, a UMA-Enabled Dual-mode Handset is connected to Base Transceiver Stations (BTS) and a Base Station Controller (BSC). In the UMAN, the same handset is connected to an Unlicensed Wireless Network (Wi-Fi, Bluetooth, etc.) and a UMA Network Controller (UNC). Both networks connect to a Core Mobile Network via a Private Network and an IP Access Network, respectively. A red circle highlights the handset and its connections to the RAN and UMAN components.</p> <p>Attachment 4 (T-Mobile Wi-Fi Calling for Government (2009)) at 1.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="380 256 1060 662">  <p style="text-align: center;">4G 5G</p> </div> <p data-bbox="380 673 1220 711">Attachment 5 (Journey to 5G –T-Mobile US Perspective) at 6.</p> <div data-bbox="390 719 1003 1352">  <p style="text-align: center; font-size: 1.5em;">Network Architecture</p> </div> <p data-bbox="380 1364 506 1401"><i>Id.</i> at 11.</p>

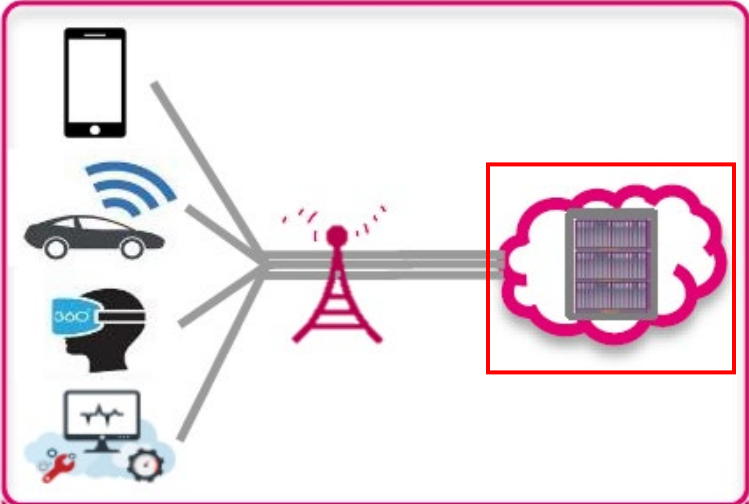
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
<p>a system of computers coupled to the at least one radio-frequency transceiver programmed to locate the at least one mobile wireless communications device and acquire an indication of a location of the at least one mobile wireless communications device,</p>	<p>Plaintiff contends that a system of computers comprises wireless device location elements, including but not limited to one or more of position determination entities (PDE), mobile location/positioning centers, mobile switching center, location proxy servers, locations applications, location agents, GPS server, Wi-Fi server, home location register, visiting location register, one or more of which are used in locating a wireless device. The various location elements are Nokia components, Nokia subsidiaries or family of companies, vendors, partners and the like. The various location elements are meant to work across one or more of all technologies, including 2G, 3G, 4G, and 5G.</p> <p>Another portion of the system of computers may be executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution is capable of locating and acquiring an indication of a location of at least one mobile wireless communications device. The system of computers is coupled to at least one RF transceiver (i.e., Base-Station, eNodeB, etc.).</p> <p>Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution has software code specifically designed for use by one or more computers. Further, Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution is designed to and does provide programming that allows the system when coupled to a base station (i.e., eNB with antenna) to locate a mobile wireless communications device(s) and generate or acquire an indication of location(s) of that device(s).</p> <p>The system loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution collects UE location information as well as network performance measurements, stores the location information and performance measurements in a memory.</p> <p>Thus, the wireless communications network comprises a system of computers executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution is part of a package of software suites. The package of software can be implemented in macrocells, small cells, and femtocells to Universal Mobile Telecommunications Service (UMTS), Long-Term Evolution (LTE), Global System for Mobile Communications (GSM), and Wi-Fi technologies. Many of these network systems, particularly the cells include base stations for transmission and reception of wireless signals to and from the mobile wireless communication devices or UEs or user devices (mobile phones, laptops, tablets, PDAs etc.). These base stations are, therefore, RF transceivers. Also, these base stations are coupled with at least one antenna for the function of transmission and reception.</p> <p>The following exemplifies this limitation's existence in Accused Systems:</p>

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Claim 1	Corresponding Structure in Accused Systems
	<div><p>The diagram illustrates a network architecture. On the left, a 'UMA-Enabled Dual-mode Handset' is shown. Two arrows originate from the handset: one points to the 'Cellular Radio Access Network (RAN)' and the other points to the 'Unlicensed Mobile Access Network (UMAN)'. The RAN section includes 'Base Transceiver Stations (BTS)' connected to a 'Private Network' cloud, which is then connected to a 'Base Station Controller (BSC)' server. The UMAN section includes an 'Unlicensed Wireless Network (Wi-Fi, Bluetooth, etc.)' connected to an 'IP Access Network' cloud, which is then connected to a 'UMA Network Controller (UNC)' server. Both the BSC and UNC servers have arrows pointing to a 'Core Mobile Network' oval on the right, which is highlighted with a red border.</p></div> <p>Attachment 4 (T-Mobile Wi-Fi Calling for Government (2009)) at 1.</p>

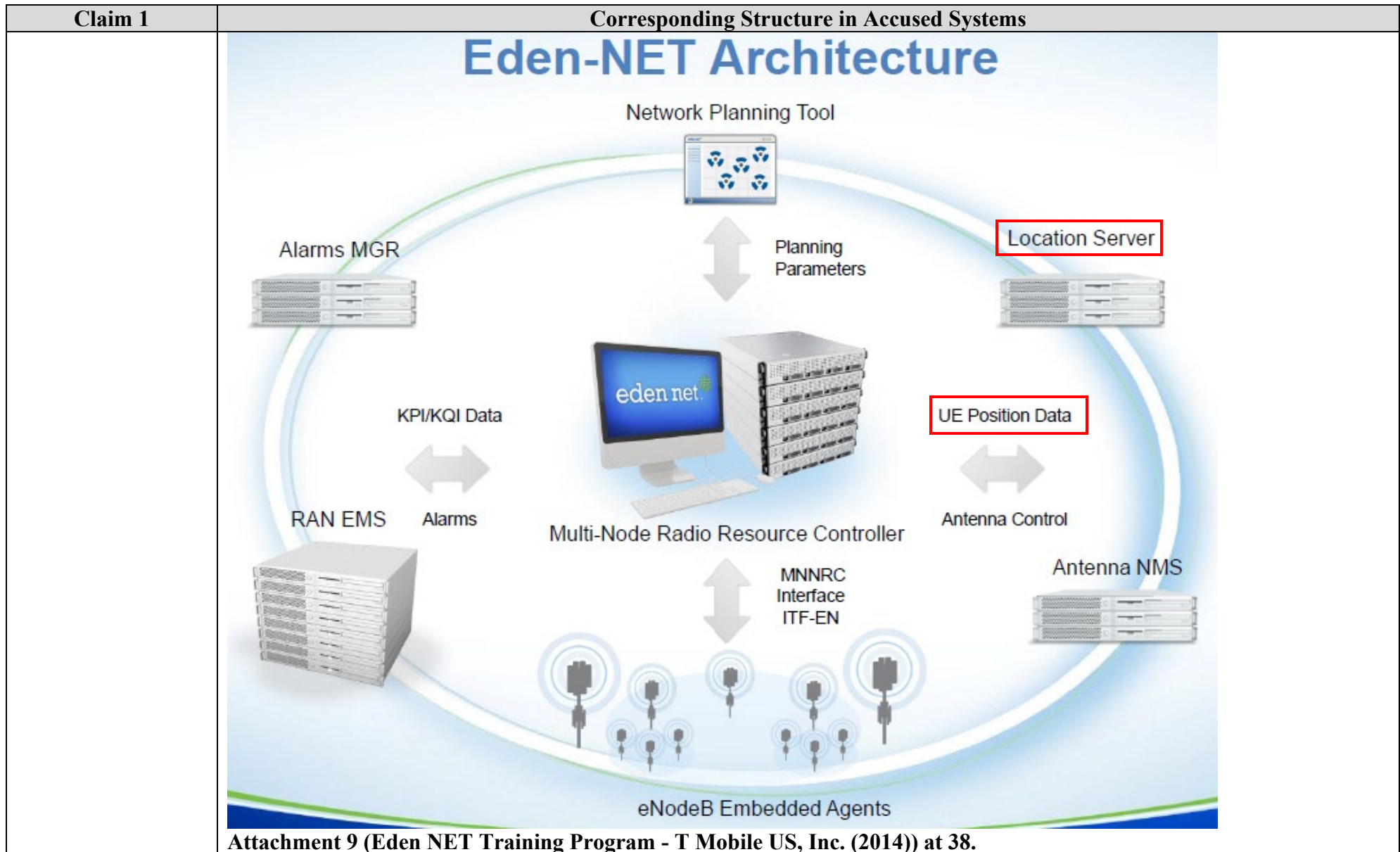
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div><p>Network Architecture</p></div> <p>Attachment 5 (Journey to 5G –T-Mobile US Perspective) at 11.</p> <p>Location Data</p> <p>We may collect your device's location whenever it is turned on (subject to coverage limitations).</p> <p>Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 5.</p>

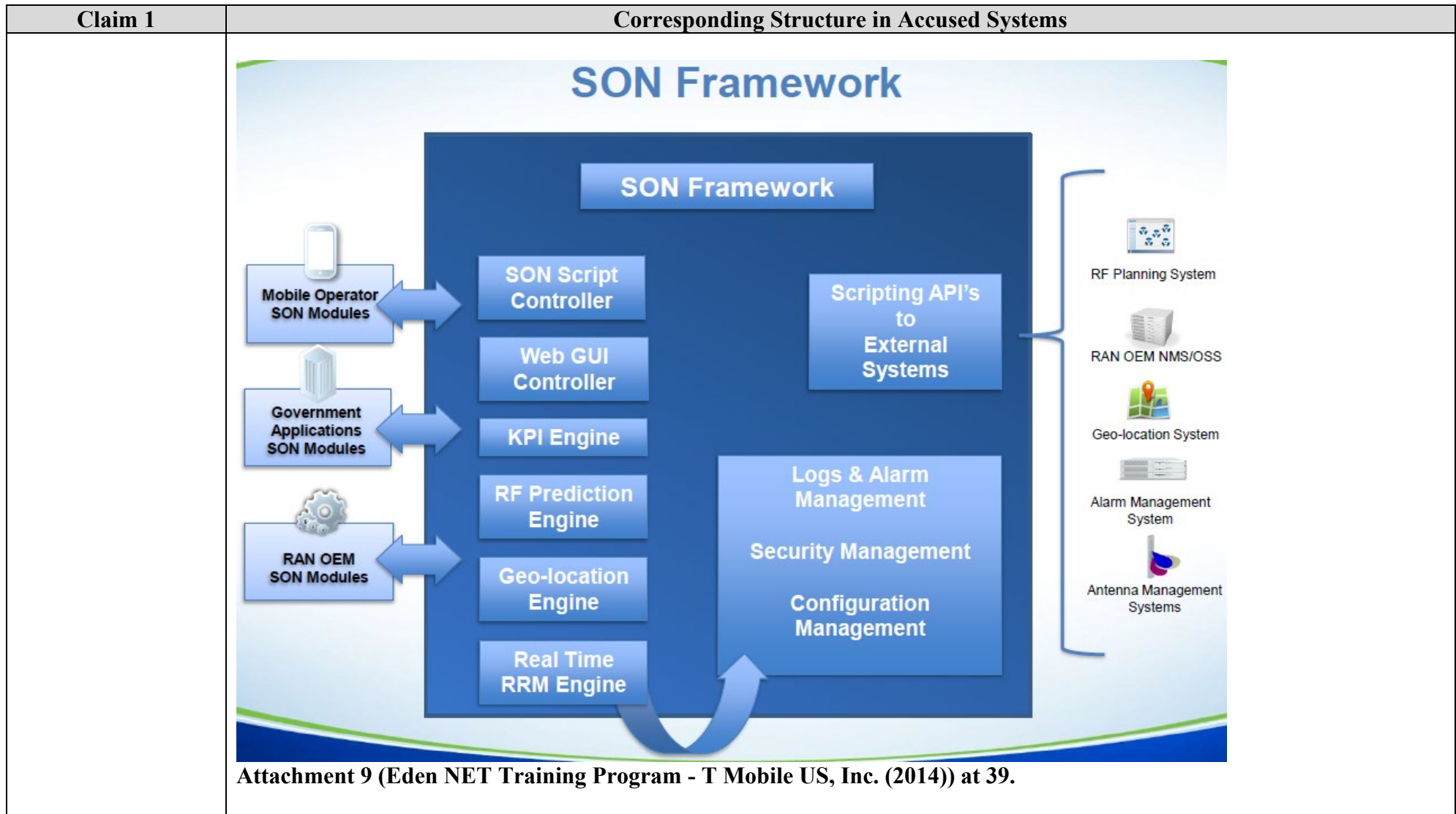
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="380 240 1961 1271"> <h3 style="text-align: center;">Eden-NET - Network Architecture Diagram</h3> <p>The diagram illustrates the Eden-NET network architecture. It features a GPRS Core Network connected to an RNC, which in turn connects to two NB (Node B) units via the Iub interface. The RNC is also connected to the HSS (Home Subscriber System). The HSS is connected to the MME (Mobility Management Entity) via the S6a interface. The MME is connected to the S-GW (Serving Gateway) via the S11 interface. The S-GW is connected to the P-GW (PDN Gateway) via the S5 interface. The P-GW is connected to the Internet via the SGi interface. The S-GW is also connected to two eNB (evolved Node B) units via the S1-u interface. The eNB units are connected to the NB units via the S1-c interface. The S-GW is connected to the 3G OSS (Operational Support System) and 4G OSS (Operational Support System) via the Itf-N interface. The 3G OSS and 4G OSS are connected to the Eden-NET (represented by a computer and server icon) via the Itf-N interface.</p> </div> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 37.</p>


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Claim 1	Corresponding Structure in Accused Systems
	<div><div><div><div><div><h3>Eden-NET OSS Level SON Solution</h3><p>New Layer of Cloud Software Intelligence for 2G, 3G, and 4G Networks.</p></div></div><div><div>OSS Level SON Framework<ul style="list-style-type: none">• SON Operating System• Supports Modular SON Application Modules• Multi-Vendor Support via Extensible Drivers• Multi-Technology SON Solution (2G, 3G, 4G)</div><div>Extensive SON Module Library<ul style="list-style-type: none">• Pre-engineered SON Modules Cover Major 3GPP/NGMN SON Use Cases• Custom User Defined Modules Supported via Open SON Scripting</div><div>Complete OSS Level SON Automation<ul style="list-style-type: none">• Map Based SON Configuration• Robust SON Security and Management Features• Intuitive Web based SON Control Panel</div></div></div><div><div>10</div><div>Nokia Internal Use</div><div>OS8461-16A-NRM</div><div>© Nokia 2017</div><div>NOKIA</div></div><div>Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 9.</div></div></div>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Eden-NET Centralized SON Server OSS Interfaces</p> <p>The diagram illustrates the data flow between three OSS systems: Another Vendor OSS, Eden-NET, and NOKIA NetAct OSS, all connected to a central Network cloud (LTE, WCDMA, GSM). The Network cloud is connected to the top of Another Vendor OSS and the bottom of NOKIA NetAct OSS. Another Vendor OSS and NOKIA NetAct OSS both have CM, PM, and Events data paths. Eden-NET is positioned in the center, receiving data from both vendors via Vendor-specific drivers. The data paths are labeled as follows: Another Vendor OSS to Eden-NET: CM Data (CORBA), PM Data (FTP), Event Data (FTP). Eden-NET to NOKIA NetAct OSS: CM Data (CORBA), PM Data (Direct to Database / FTP), Event Data (CORBA). The interfaces between the vendors and Eden-NET are labeled as Itf-N interface.</p> <p>Configuration Management (CM)</p> <ul style="list-style-type: none"> CM data retrieved and pushed over CORBA interface <p>Performance Monitoring (PM) data</p> <ul style="list-style-type: none"> PM data retrieved via FTP, CORBA or via direct data base access for NetAct Other vendor example - PM data retrieved via FTP for Ericsson OSS-RC <p>Event Data</p> <ul style="list-style-type: none"> NOKIA Megamon data retrieved via FTP Other vendor example - Ericsson GPEH data retrieved via FTP <p>Other supported interfaces: Direct to Database, SOAP and XML</p> <p>Vendor-specific software drivers are needed to integrate new system</p> <p>13 Nokia Internal Use OS8461-16A-NRM © Nokia 2017 NOKIA</p> <p>Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 12.</p>

INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<p>WHAT TYPES OF INFORMATION WE COLLECT ABOUT YOU ↑ top</p> <hr/> <p>We collect information about you and your associated device(s) when you use our products or services or otherwise interact with us or with third-party services through our products and services. Examples of the types of information we collect include:</p> <p>Personal Information</p> <p>"Personal Information" means information that we directly associate with a specific person or entity (for example, name; addresses; telephone numbers; email address; Social Security Number; call records; wireless device location). Personal information does not include "de-identified," "anonymous," or "aggregate" information – which are not associated with a specific person or entity.</p> <p>Customer Proprietary Network Information (CPNI)</p> <p>Customer Proprietary Network Information, or "CPNI", is a subset of Personal Information that is generated in connection with the telecommunications services we provide to you. CPNI includes, for example, call details, call location information, and certain information about your rate plans and features. CPNI does not include your name, address, and phone number.</p> <p>Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 4.</p> <p>Information We Collect Automatically</p> <p>We automatically collect a variety of information associated with your use of your device (on our network, when roaming, or in WiFi mode) and our products and services, some of which may be associated with you or another user on your account.</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>For example some of the ways we may automatically collect information include:</p> <ul style="list-style-type: none"> • Our systems capture details about the type and location of wireless device(s) you use, when the device is turned on, calls and text messages you send and receive (but we do not retain the content of those calls or messages after delivery), and other data services you use. • We may also gather information about the performance of your device and our network. Some examples of the types of data collected include: the applications on the device, signal strength, dropped calls, data failures, and other device or network performance issues. <p>Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 6.</p> <p>Location-Based Services</p> <p>We use location information to route wireless communications and to provide 911 service, which allows emergency services to locate your general location. We may disclose, without your consent, the approximate location of a wireless device to a governmental entity or law enforcement authority when we are served with lawful process or reasonably believe there is an emergency involving risk of death or serious physical harm.</p> <p>Depending on your device, you may also be able to obtain a wide array of services based on the location of your device (for example, driving directions, enhanced 411 Directory Assistance, Find My Device, or search results, etc.). These data services, known as Location-Based Services ("LBS") are made available by us and others, usually via applications. These services use various location technologies and acquire location data from various sources.</p> <p>These applications and services use various location technologies (including Global Positioning Satellite ("GPS"), Assisted GPS ("AGPS"), cell ID and enhanced cell ID technologies) to identify the approximate location of a device, which is then used in conjunction with the application to enhance the user's experience (for example, to provide driving directions, to provide enhanced 411 Directory Assistance, or search results, etc.)</p> <p>Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 8 and 9.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p style="text-align: center;">Observed Time Difference of Arrival</p> <p>OTDOA is an LTE network based, multilateration method in which a handset measures the time difference between specific signals sent from base stations within its vicinity; the handset then reports these time differences to its affiliated wireless network. The network then uses these time differences in conjunction with the location of the applicable base stations to calculate a location estimate of the 9-1-1 caller. OTDOA technology increases T-Mobile's ability to remain compliant on its LTE network in areas where the primary positioning method AGPS does not work, for example in some indoor locations and dense urban areas. T-Mobile has completed deployment of OTDOA technology across its LTE network and is continually optimizing the OTDOA network to increase accuracy and availability of reported positions.</p> <p>T-Mobile has also deployed additional functionality on its LTE Location Server to enhance the accuracy and availability of OTDOA, such as Positioning Resource Signal muting and Inter-frequency OTDOA, as these features have been standardized and made available for implementation. T-Mobile has developed in-house tools to improve the accuracy of site level provisioned parameters, and to detect and correct provisioning errors. Increasing the accuracy of provisioned data, and calibrating out cable delays, optimizes achievable accuracy from this important new location technology.</p> <p>Attachment 2 (T-Mobile's Implementation Plan and 18 Month Status Report For Implementing the Federal Communication Commission's Fourth Report and Order on Wireless E911 Location Accuracy Requirements (2017)) at 16 and 17.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>T-Mobile has invested resources to upgrade its UMTS and LTE Location Servers to support GLONASS satellite functionality, in addition to AGPS. It is well known that adding a 2nd satellite constellation can significantly improve both accuracy and availability of the resulting location estimates, especially in many challenging indoor environments. Moreover, T-Mobile's systems include processes to disable network-based location measurements received through GLONASS for location estimate calculations as needed. T-Mobile has not begun to utilize this newly available functionality to improve 9-1-1 location performance, pending receive-only authorization from the FCC.</p> <p>Attachment 2 (T-Mobile's Implementation Plan and 18 Month Status Report For Implementing the Federal Communication Commission's Fourth Report and Order on Wireless E911 Location Accuracy Requirements (2017)) at 17.</p> <div style="border: 1px solid red; padding: 2px; margin: 10px 0;">Location Services</div> <p>Location-Based Services</p> <p>Would you use a mobile application (downloaded to your mobile phone/device) that helped you find the nearest gas station, sent your device e-coupons for nearby shops, warned you when your teenager leaves a pre-set geographic area, or allows you and your friends to locate one another on an interactive map? From the relatively mundane to the cutting edge, Location Based Services ("LBS") have arrived. Driven by the recent availability of mobile devices capable of running downloadable applications (e.g., smartphones and other 3rd generation ("3G") network devices), the potential uses of device location to improve users' overall mobile experience is virtually limitless.</p> <p>But, as with any technology, LBS carries with it certain risks – including the potential for misuse. No mobile device user should be "tracked" without their knowledge and consent (or in the case of minors or employees provided a device by their parents or employers, respectively, at least without the user's knowledge). It's therefore critical that mobile device users be aware of how their device location is being gathered, used, and shared – and by whom!</p> <p>Attachment 8 (About T-Mobile – Location Services (Webpage, 2014)) at 2 of 6.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Network Location</p> <p>The use of mobile device location is not new – it's always been used by wireless carriers to provide mobile service. Indeed, in order for mobile communications to work, the carrier (e.g., T-Mobile) must remain aware of the approximate location of all mobile devices using the carrier's network. This is how the carrier is able to route wireless communications (calls, text messages, etc.) to and from the devices even as they are moving. It's also how carriers provide enhanced 9-1-1 ("E9-1-1") service for mobile devices – i.e., allowing carriers to provide approximate device location to emergency officials in response to a 9-1-1 call made from a mobile device. In other words, whenever a mobile device is turned on and is within range of a carrier's cell tower(s), the device sends periodic signals that are read by those tower(s). Communications directed to or from the device are then routed to the nearest cell tower, and as the device moves closer to a different tower, the carrier's network redirects the communications to the new tower.</p> <p>Only recently have on-device applications progressed to the point of using such network-based location information to facilitate the application. Thus, for example, by identifying the zip code of the cell tower to which the mobile device is currently connected, the weather forecast displayed on a mobile web page can be easily customized based on current location – as opposed to requiring the user's entry of the location or defaulting to a preset address. Similarly, a search entered on a mobile search engine can be automatically enhanced to provide the most geographically relevant results. (E.g., if searching for pizza, the results can focus on the zip code in which the device is currently operating.) It should be noted, however, that due to technical constraints, the network-based location data is not always precise – ranging from simply the location of the nearest cell tower to within tens of meters of the device – depending on various factors.</p> <p>Satellite Location</p> <p>Many newer mobile devices also contain a built-in Global Positioning Satellite ("GPS") component (similar to navigation systems in automobiles). These GPS-enabled devices measure distances from various government-owned satellites to pinpoint the device location. Once the device identifies its own location, that information can be utilized by an application (e.g., a mapping program to provide driving directions) or it can be communicated to others (e.g., a social networking application that shares current location among friends) using the ordinary communication protocols of the device. GPS location data can be incredibly accurate – with precision measured within a few feet.</p> <p>Attachment 8 (About T-Mobile – Location Services (Webpage, 2014)) at 2 & 3 of 6.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>5.3 LTE1049: MDT - UE Measurement Logs</p> <p>5.3.1 Description of LTE1049: MDT - UE Measurement Logs</p> <p>Introduction to the feature</p> <p>The <i>LTE1049: MDT - UE Measurement Logs</i> feature allows the eNodeB to support the configuration and retrieval of user equipment (UE) measurement logs as well as to report those with a cell trace.</p> <p>...</p> <p>operators. A minimization of drive tests (MDT) has been proposed in order to meet operator requirements. It is a method of collecting the DT data directly from regular UEs used in the network; it is a less expensive approach to DTs. There are two modes of MDT measurements:</p> <p>...</p> <p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (global navigation satellite system (GNSS) information is optional for the UE) • time stamp • serving cell ID • serving cell measurements • neighbor cell measurements <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 308 and 309.</p> <p>3.4 LTE951: Enhanced Cell ID Location Service</p> <p>3.4.1 Description of LTE951: Enhanced Cell ID Location Service</p> <p>Introduction to the feature</p> <p>The <i>LTE951: Enhanced Cell ID Location Service</i> feature improves location reporting by introducing enhanced cell ID reporting (E-CID) to the E-Serving Mobile Location Center (E-SMLC).</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>...</p> <p>End-user benefits</p> <p>This feature:</p> <ul style="list-style-type: none"> • enables determining UE position in case of emergency calls • enables using applications requesting UE positioning (for example maps, etc.) <p>Operator benefits</p> <p>This feature allows the operator to turn the location services in a cell on and off.</p> <p>...</p> <p>Providing the operator's network contains a mobility management entity (MME) and E-SMLC provided by other vendors, it is assumed that these network elements support the LPPa messaging for E-CID before the <i>LTE951: Enhanced Cell ID Location Service</i> feature is deployed. It is also assumed that any timers on the MME and E-SMLC (that are preventing message response timeouts) can be adjusted as they are needed to ensure successful inter-operability with Nokiaan eNB.</p> <p>Functional description</p> <p>Functional overview</p> <p>The <i>LTE951: Enhanced Cell ID Location Service</i> feature introduces enhanced cell ID (E-CID) location services.</p> <p>The location service is performed in two steps:</p> <ol style="list-style-type: none"> 1. The UE is positioned based on its serving cell's ID. 2. The UE is positioned more accurately inside a single cell, using one of the following four methods: <ul style="list-style-type: none"> • Timing advance type 1 • Timing advance type 2 • Intra-frequency Reference Signal Received Power (RSRP) and/or Reference Signal Received Quality (RSRQ)

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Claim 1	Corresponding Structure in Accused Systems
	<p data-bbox="384 245 1612 272">Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 63 and 64.</p> <div data-bbox="384 305 1478 365" style="border: 2px solid red; padding: 5px;"> <p>Positioning information source (3GPP TS 37.320)</p> </div> <div data-bbox="415 386 976 1133" style="background-color: #003366; color: white; padding: 10px;"> <p>UMTS</p> <ul style="list-style-type: none"> The feature RAN2496 (RU50) enables sending periodic GPS measurements locations of UE, supporting UE-Based reporting during CS/PS connection. Only UEs in Cell_DCH state (Immediate MDT) will report measurements Periodicity from 2 to 32 s Measurements are contained in measurements report between UE and RNC and it possible to correlate this information with other events (RSCP, Ec/N0, etc.) <p>LTE</p> <ul style="list-style-type: none"> Immediate MDT: LTE1308 (LTE16) enables GPS periodic position identification of UEs via Cell trace interface eNB in connected mode. <ul style="list-style-type: none"> The information can be correlated to other network events or UE using call trace Reporting interval from 120 ms to 60 min Logged MDT: LTE 1049 (LTE15A) enables GPS periodic position identification with radio information of UEs in idle Mode. <ul style="list-style-type: none"> Logging interval from 1.280 to 61.440 s Logging duration from 10 to 120 min </div> <div data-bbox="399 1117 619 1166" style="font-size: small;"> <p>5 Confidential © Nokia 2016</p> </div> <div data-bbox="1039 365 1927 1128" style="text-align: center;"> <div style="background-color: #808080; color: white; padding: 5px; margin-bottom: 10px;"> GPS reporting capability of UE from real networks: UMTS: 20 ÷ 25% LTE: 3 ÷ 5% </div> </div> <div data-bbox="1774 1136 1900 1166" style="text-align: right;"> <p>NOKIA</p> </div>
	<p data-bbox="384 1182 2026 1247">Attachment 13 (Minimization of Drive Test (MDT) An Innovative Methodology for Measuring Customer Performance on Mobile Network (2016)) at 5.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>6.1.1 MDT - UE measurement logs</p> <p>Unique ID: 1049</p> <p>Short Description:</p> <p>The eNode B supports the configuration and the retrieval of UE measurement logs.</p> <p>Benefits for the Customer:</p> <p>The UE measurement log function can be used to minimize the drive test effort.</p> <p>Functional Description:</p> <p>The Flexi Multiradio BTS supports the handling of UE measurement logs.</p> <p>The feature comprises of</p> <ul style="list-style-type: none"> • configuration of UE measurement logs and • retrieval of UE measurement logs. <p><u>Content of UE measurement log:</u></p> <div style="border: 1px solid red; padding: 5px; margin: 10px 0;"> <p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (GNSS information is optional for the UE) • time stamp • serving cell ID • serving cell measurements (RSRP, RSRQ) • neighbor cell measurements (RSRP, RSRQ, RSCP, Ec/N0, RxLev,...) </div> <p>The UE collects the measurement data during RRC IDLE and stores is up to 48 hours. The maximum log size is 520 entries. The support of this functionality is optional for 3GPP R10 UEs.</p> <p>The configuration of UE measurement logs and the retrieval of measurement logs is applied only for UEs with related UE capabilities and with according settings of the IE 'Management based MDT allowed' in case of cell trace or UEs selected by the MME in case of subscriber trace. The IE 'Management based MDT allowed' is received either via S1 and X2, e.g. at initial UE context setup or during handover. The IE is forwarded during X2 handover.</p> <p>Attachment 18 (LTE RAN Release RL70 Feature Candidate Document (2013)) at 42.</p>

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Claim 1	Corresponding Structure in Accused Systems
<p>wherein the system of computers further receives and stores performance data of connections between the at least one mobile wireless communications device and the at least one radio frequency transceiver along with the indication of the location,</p>	<p>Plaintiff contends that the system of computers executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution; and operating, implementing and supporting SON solution in the wireless telecommunications network, corresponds to this claim limitation, as the system of computers executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution receives performance data of connections between the one or more mobile wireless communications devices and radio frequency transceivers (i.e., base-stations or radio towers) from the MDT (Minimization of Drive Tests) reports, UE Measurement Reports, etc. and stores the performance data along with indication of the location.</p> <p>Nokia Eden-Net (or Nokia iSON or Nokia NetAct) software codes are programmed to store the performance data and corresponding location for a wireless device in a memory associated with the system of computers because the software codes are programmed to collect performance measurements pertaining to qualitative and quantitative aspects of the operation of wireless network.</p> <p>The system of computers installed or compatible with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution routinely receives performance measurements pertaining to qualitative and quantitative aspects (for example, expressed in terms of Key Performance Indicators or KPIs, Performance Statistics, Performance Indicator, etc.) of RF-based interactions between the UEs and the base-stations which can include performance data along with location information of mobile wireless communications devices. Further, the collected data is stored in a cache.</p> <p>The system of computers comprises computers associated with the at least one base station controller(s); computers functioning for network optimization, including at least computers implementing D-SON and C-SON; and, computers functioning for locating wireless devices. There is no requirement that each computer of the system of computers locates a UE.</p> <p>The following exemplifies this limitation's existence in Accused Systems:</p> <p>Information We Collect Automatically</p> <p>We automatically collect a variety of information associated with your use of your device (on our network, when roaming, or in WiFi mode) and our products and services, some of which may be associated with you or another user on your account.</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>For example some of the ways we may automatically collect information include:</p> <ul style="list-style-type: none"> • Our systems capture details about the type and location of wireless device(s) you use, when the device is turned on, calls and text messages you send and receive (but we do not retain the content of those calls or messages after delivery), and other data services you use. • We may also gather information about the performance of your device and our network. Some examples of the types of data collected include: the applications on the device, signal strength, dropped calls, data failures, and other device or network performance issues. <p>Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 6.</p> <p>Location-Based Services</p> <p>We use location information to route wireless communications and to provide 911 service, which allows emergency services to locate your general location. We may disclose, without your consent, the approximate location of a wireless device to a governmental entity or law enforcement authority when we are served with lawful process or reasonably believe there is an emergency involving risk of death or serious physical harm.</p> <p>Depending on your device, you may also be able to obtain a wide array of services based on the location of your device (for example, driving directions, enhanced 411 Directory Assistance, Find My Device, or search results, etc.). These data services, known as Location-Based Services ("LBS") are made available by us and others, usually via applications. These services use various location technologies and acquire location data from various sources.</p> <p>These applications and services use various location technologies (including Global Positioning Satellite ("GPS"), Assisted GPS ("AGPS"), cell ID and enhanced cell ID technologies) to identify the approximate location of a device, which is then used in conjunction with the application to enhance the user's experience (for example, to provide driving directions, to provide enhanced 411 Directory Assistance, or search results, etc.)</p> <p>Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 8 and 9.</p>

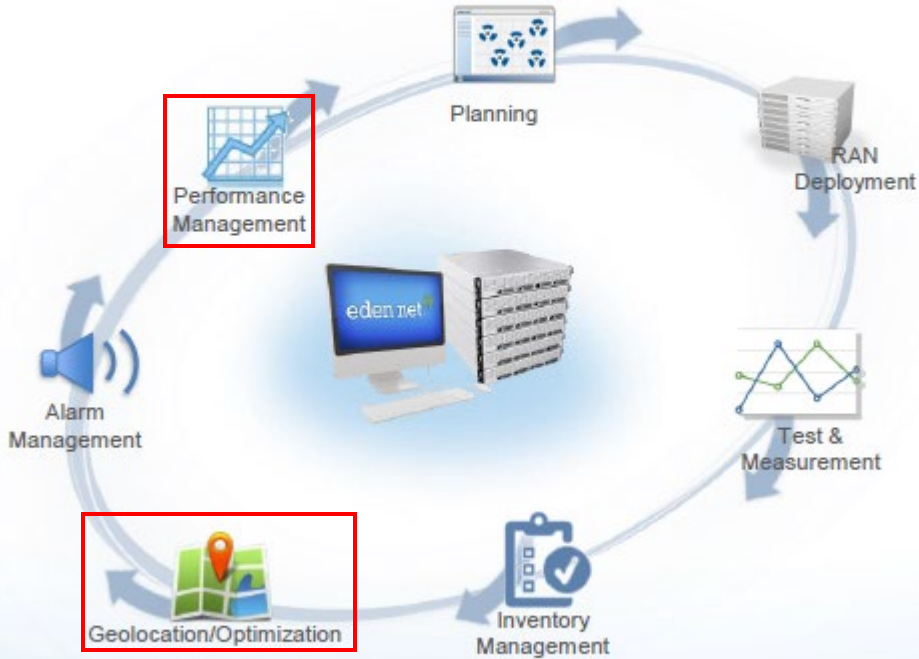
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<p data-bbox="388 240 583 280">Location Data</p> <p data-bbox="388 289 1577 321">We may collect your device's location whenever it is turned on (subject to coverage limitations).</p> <p data-bbox="388 354 852 394">Performance and Diagnostic Data</p> <p data-bbox="388 402 1787 613">We may collect performance and diagnostic data about your use of our network, networks you roam on, WiFi services or your device. For example, we may collect information about the performance of the device, signal strength, dropped calls, data failures, battery strength and other device or network performance issues. We may also collect information about applications on your device, the fact that an application has been added, when an application is launched or fails to launch, and length of time an application has been running.</p> <p data-bbox="388 621 1434 662">Attachment 1 (T-Mobile Privacy Statement Highlights (Webpage, 2016)) at 5.</p>

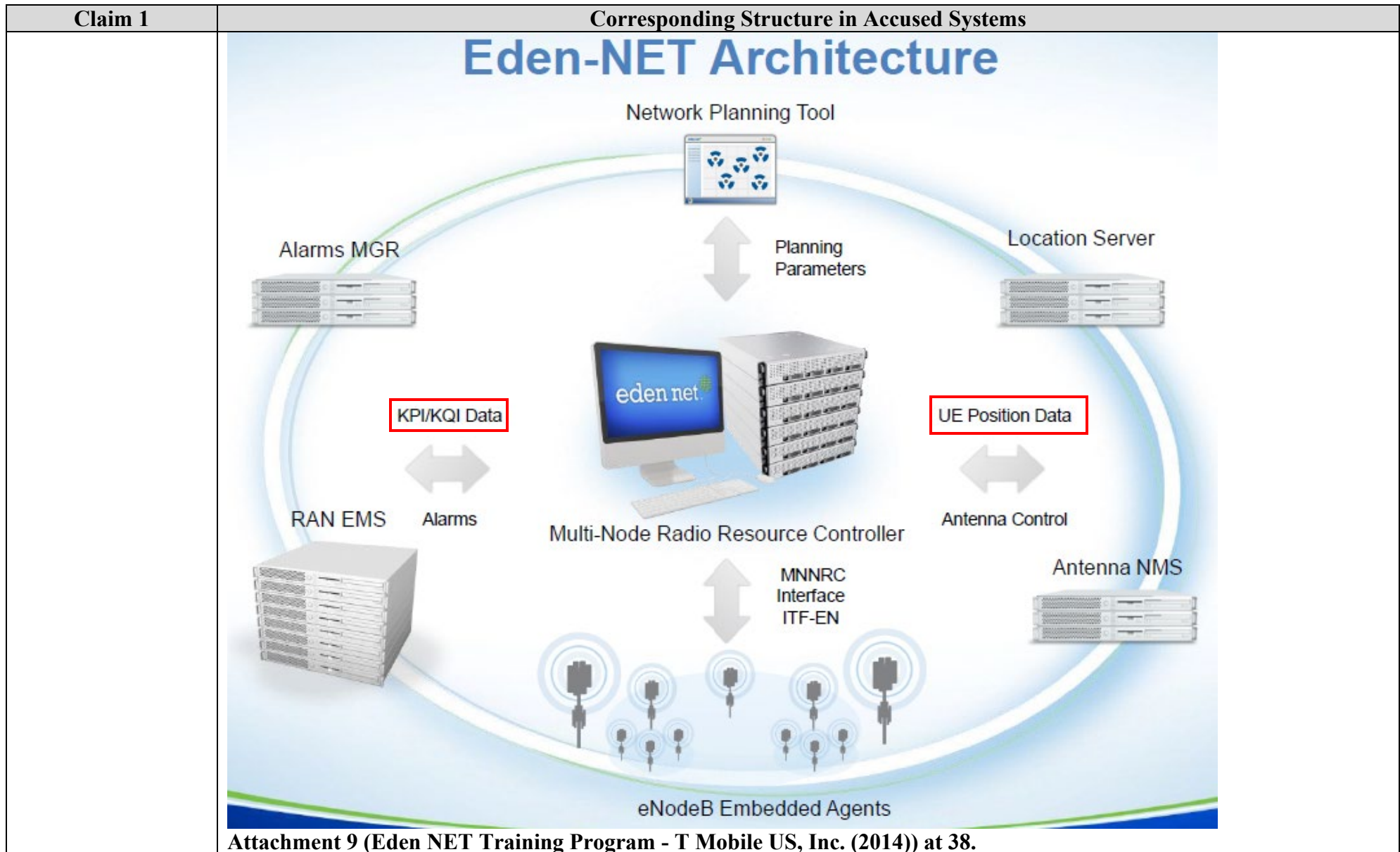
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="394 245 1446 553"> <p>Optimization Use Cases</p> <p>[O01] Radio Parameter Optimization: Neighbor cell list optimization</p> <p>[O02] Radio Parameter Optimization: Interference Control</p> <p>[O03] Radio Parameter Optimization: HO parameterization optimization</p> <p>[O04] Radio Parameter Optimization: QoS related parameter optimization</p> <p>[O05] Radio Parameter Optimization: Optimization Scenarios with Home BS/Pico BS</p> <p>[O06] Transport Parameter Optimization: Routing Optimization</p> <p>[O07] Transport Parameter Optimization: Optimization Scenarios with Home BS/Pico BS</p> <p>[O08] Reduction of Energy Consumption</p> <p>[ERO01] Capacity Optimization (Congestion Prime)</p> </div> <div data-bbox="394 553 1446 1032"> <p>Maintenance Use Cases</p> <p>[Ops01] Hardware / Capacity extension (Easy plug and play hardware replacement)</p> <p>[Ops02] Autonomous Inventory</p> <p>[Ops03] Automatic SW Download to Base Station</p> <p>[Ops04] Automated NEM upgrade</p> <p>[Ops05] Cell outage detection</p> <p>[Ops06] Performance Management in real time</p> <p>[Ops07] Direct KPI reporting in real time</p> <p>[Ops08] Information Correlation for Fault Management</p> <p>[Ops09] Subscriber and Equipment trace</p> <p>[Ops10] Cell Outage Compensation</p> <p>[Ops11] Compensation for Outage of higher level network elements (ASN GW)</p> <p>[Ops12] Fast recovery on instable NEM system</p> <p>[Ops13] Mitigation of outage of units</p> <p>[EROps01] System Availability</p> </div> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 10.</p>

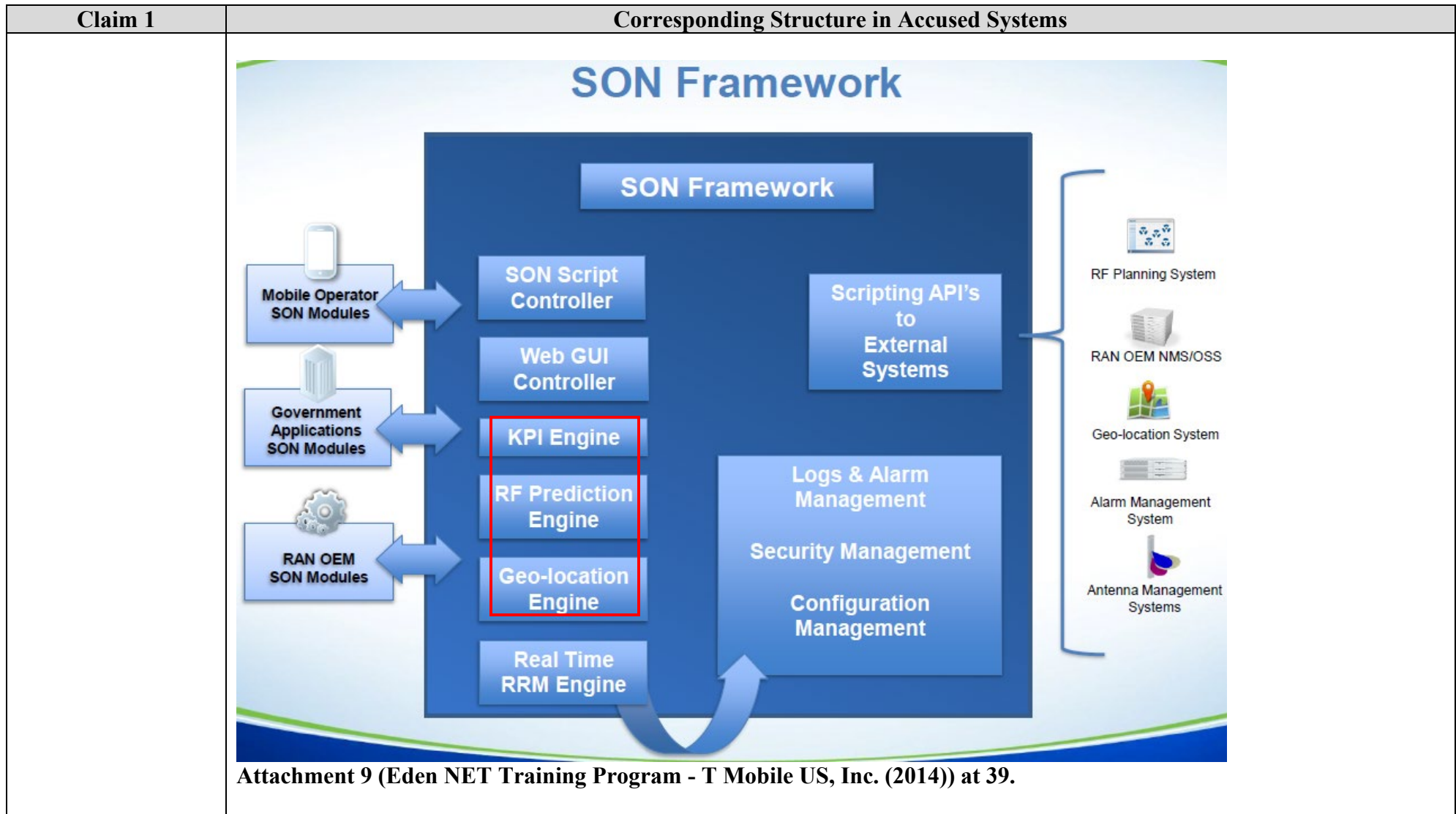
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="380 240 1770 1252"> <p style="text-align: center;">SON is Essential for Mobile Operators</p> <p style="text-align: center;">Robust SON solutions address the full portfolio of management tools that carriers need.</p>  <p style="text-align: center;">The platform of SON automates data exchange between each tool/function.</p> </div> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 24.</p>

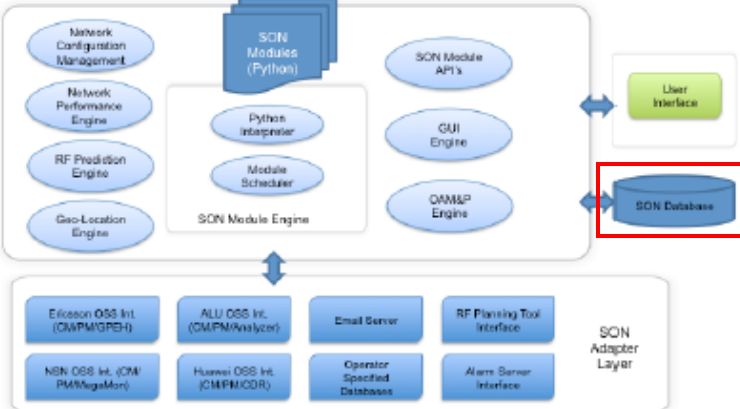
INFRINGEMENT CONTENTIONS
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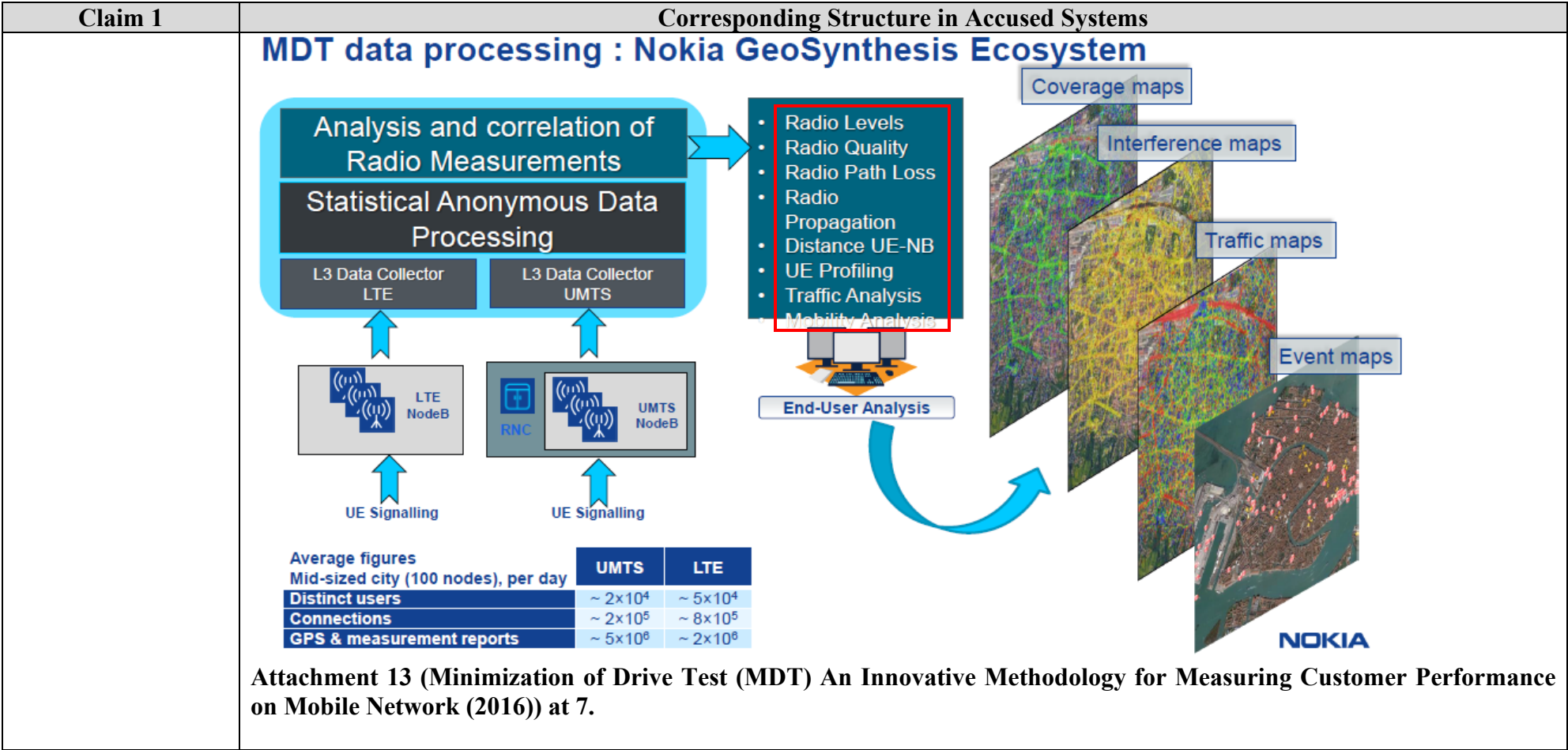
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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="380 240 1900 1190"> <h2 style="text-align: center;">Eden-NET® Solution</h2> <p style="text-align: center;">Centralized, Multi-Vendor, Multi-Technology, Highly Extensible SON Operating System with Rich Toolbox of SON Modules.</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  <p>The diagram illustrates the Eden-NET architecture. At the top, a stack of 'SON Modules (Python)' is connected to a 'Python Interpreter' and a 'Module Scheduler' within the 'SON Module Engine'. To the left of the engine are four modules: 'Network Configuration Management', 'Network Performance Engine', 'RF Prediction Engine', and 'Geo-Location Engine'. To the right are 'SON Module APIs', 'GUI Engine', and 'QAM&P Engine'. A 'User Interface' is connected to the 'SON Module Engine' and a 'SON Database' (highlighted with a red box). Below the engine is the 'SON Adapter Layer' containing six components: 'Ericsson OSS Int. (CMPM/GPEH)', 'ALU OSS Int. (CMPM/Analyzer)', 'Email Server', 'RF Planning Tool Interface', 'NSN OSS Int. (CMPM/NegaMon)', 'Huawei OSS Int. (CMPM/COR)', 'Operator Specified Databases', and 'Alarm Server Interface'.</p> </div> <div style="width: 45%;"> <p>Autonomous Network Optimization Modules</p> <p>ANR Lists, Handover Parameters, Reuse Parameters, Antenna Parameters, Control Channel Parameters, and Tracking Area.</p> <p>Workflow Automation Modules</p> <p>Automatic Performance Reports, Real Time Alerts, UMTS Automatic Rehomes, Hotspot Identification, Spectrum Clearing – Underutilized Cells, Parameter Consistency, and Plug & Play.</p> <p>Network Reliability Automation Modules</p> <p>Sleeping Cell Resolution, Cell Outage Detection And Compensation, and Crossed antenna feeder detection.</p> <p>Dynamic Network Adaptation Modules</p> <p>Traffic Load Balancing (MLB), UMTS Uplink Noise, Special Events, and Network Energy Savings.</p> </div> </div> </div> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 41.</p>

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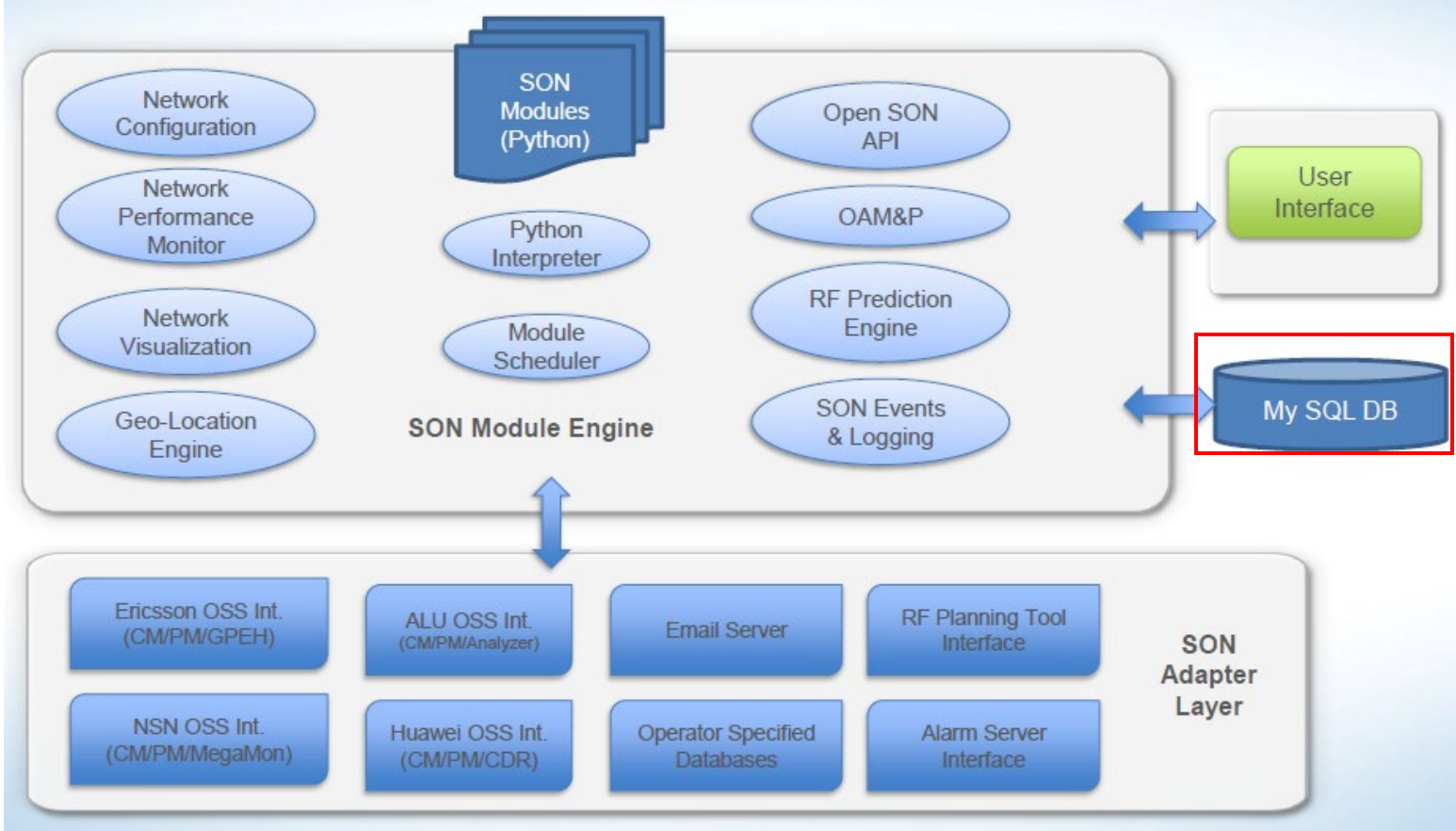
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<div><h3>MDT measurements in detail (UMTS)</h3><div><div>Connected Mode</div><div><div>Layer 3</div><div><ul style="list-style-type: none">• GPS location shape: latitude, longitude, altitude, uncertainty semi-axes• RSCP and Ec/N0 of up to 3 Active Set cells• RSCP and Ec/N0 of up to 2 best monitored cells• Ue Tx Power• UeRxTxTimeDifference Type 1 for each of the Active Set cells</div></div><div><div>Layer 2</div><div><ul style="list-style-type: none">• Round Trip Time for each radio link in Active Set• Transport Channel DL BLER for each radio link in Active Set• SIR and SIR Error<p>Unlike LTE, UMTS has quite a few Layer 2 periodic reports: payload and TTI assignment are not available. Payload can be retrieved with other non-periodical internal RNC reports and pivoted on each GPS coordinate. TTI assignment cannot be retrieved, thus preventing a reliable throughput estimation.</p></div></div></div><div>Es</div><div>...</div></div>

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Claim 1	Corresponding Structure in Accused Systems	
	MDT measurements in detail (LTE)	
	<div>Connected Mode</div> <div><div>Layer 3</div><div><ul style="list-style-type: none">• GPS location shape: latitude, longitude, altitude, uncertainty semi-axes• RSRP and RSRQ of serving cell (primary cell in case of CA)• RSRP and RSRQ of 1st to 8th monitored LTE intra-frequency neighbour cells, identified with PCI</div></div> <div><div>Layer 2</div><div><ul style="list-style-type: none">• PUCCH and PUSCH SINR• Power Headroom• Timing Advance (instantaneous or continual)• Rank Indicator• Single/Dual code word Tx• Single/Dual code word Tx failures• Downlink/uplink delays• Downlink/uplink PDCP data volumes• Number if TTIs with buffered data• Wideband CQI• Uplink Modulation and Coding Scheme• PDSCH and PUSCH Physical Resource Blocks allocation</div></div>	<div>Idle Mode</div> <div><div><ul style="list-style-type: none">• GPS location shape: latitude, longitude, altitude, uncertainty semi-axes• Acquisition timestamp• RSRP and RSRQ of serving cell• RSRP and RSRQ of 1st to 8th monitored LTE intra-frequency neighbour cells, identified with eutraCellId• RSRP and RSRQ of 1st to 8th monitored LTE inter-frequency neighbour cells, identified with eutraCellId (**)• RSCP and Ec/N0 of 1st to 8th monitored UMTS neighbour cells, identified with PSC• RxLev of 1st to 8th monitored GSM inter-RAT neighbour cells, identified with BSIC</div><div>No MDT data</div></div>
	Attachment 13 (Minimization of Drive Test (MDT) An Innovative Methodology for Measuring Customer Performance on Mobile Network (2016)) at 9 and 10.	

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Claim 1	Corresponding Structure in Accused Systems
	 <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 42.</p> <p>5.3 LTE1049: MDT - UE Measurement Logs</p> <p>5.3.1 Description of LTE1049: MDT - UE Measurement Logs</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Introduction to the feature</p> <p>The <i>LTE1049: MDT - UE Measurement Logs</i> feature allows the eNodeB to support the configuration and retrieval of user equipment (UE) measurement logs as well as to report those with a cell trace.</p> <p>...</p> <p>operators. A minimization of drive tests (MDT) has been proposed in order to meet operator requirements. It is a method of collecting the DT data directly from regular UEs used in the network; it is a less expensive approach to DTs. There are two modes of MDT measurements:</p> <p>...</p> <p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (global navigation satellite system (GNSS) information is optional for the UE) • time stamp • serving cell ID • serving cell measurements • neighbor cell measurements <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 308 and 309.</p> <p>3.4 LTE951: Enhanced Cell ID Location Service</p> <p>3.4.1 Description of LTE951: Enhanced Cell ID Location Service</p> <p>Introduction to the feature</p> <p>The <i>LTE951: Enhanced Cell ID Location Service</i> feature improves location reporting by introducing enhanced cell ID reporting (E-CID) to the E-Serving Mobile Location Center (E-SMLC).</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>End-user benefits</p> <p>This feature:</p> <ul style="list-style-type: none"> • enables determining UE position in case of emergency calls • enables using applications requesting UE positioning (for example maps, etc.) <p>Operator benefits</p> <p>This feature allows the operator to turn the location services in a cell on and off.</p> <p>...</p> <p>Providing the operator's network contains a mobility management entity (MME) and E-SMLC provided by other vendors, it is assumed that these network elements support the LPPa messaging for E-CID before the <i>LTE951: Enhanced Cell ID Location Service</i> feature is deployed. It is also assumed that any timers on the MME and E-SMLC (that are preventing message response timeouts) can be adjusted as they are needed to ensure successful inter-operability with Nokiaan eNB.</p> <p>Functional description</p> <p>Functional overview</p> <p>The <i>LTE951: Enhanced Cell ID Location Service</i> feature introduces enhanced cell ID (E-CID) location services.</p> <p>The location service is performed in two steps:</p> <ol style="list-style-type: none"> 1. The UE is positioned based on its serving cell's ID. 2. The UE is positioned more accurately inside a single cell, using one of the following four methods: <ul style="list-style-type: none"> • Timing advance type 1 • Timing advance type 2 • Intra-frequency Reference Signal Received Power (RSRP) and/or Reference Signal Received Quality (RSRQ) <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 63 and 64.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Intra-frequency Reference Signal Received Power (RSRP) and/or Reference Signal Received Quality (RSRQ)</p> <p>These measurements are performed by a UE and reported to an eNB. When a request for the RSRP, or RSRQ, or both of them arrives at an eNB, the eNB initiates an intra-frequency measurement configuration at the UE with a reportStrongestCells purpose.</p> <p>The exact type of this measurement is set by the value of triggerQuantity. Subject to a desired measurement, its value is set either to RSRP (in case the RSRP or both measurements are requested), or RSRQ (in case only this measurement is needed).</p> <p>The UE sends a measurement report to the eNodeB, which in turn sends the RSRP and/or RSRQ measurements to the E-SMLC, which calculates the UE's position.</p> <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 66.</p> <p>The LTE CCO continually assesses the impact of network changes based on network KPIs. It verifies that the implemented changes are having a positive impact on the network by monitoring specific KPIs. These KPIs are selected from the following areas:</p> <ul style="list-style-type: none"> • LTE accessibility, retainability, traffic, IRAT volumes, physical resource block utilization and channel quality indicator distributions • WCDMA accessibility, retainability, traffic, IRAT leakage and handover volumes • GSM accessibility, retainability, traffic, and handover <p>Attachment 15 (LTE Coverage and Capacity Optimization Guide (2017)) at 8.</p>
wherein the system of computers, responsive to a first user input specifying a selection between operating in an	<p>Plaintiff contends that a system of computers comprises wireless device location elements, including but not limited to one or more of position determination entities (PDE), mobile location/positioning centers, mobile switching center, location proxy servers, locations applications, location agents, GPS server, Wi-Fi server, home location register, visiting location register, one or more of which are used in locating a wireless device. The various location elements are Nokia components, Nokia subsidiaries or family of companies, vendors, partners and the like. The various location elements are meant to work across one or more of all technologies, including 2G, 3G, 4G, and 5G. The system of computers can be toggled or switched between an active mode and a passive mode for tracking a wireless device.</p>

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Claim 1	Corresponding Structure in Accused Systems
active mode or a passive mode,	<p>The system of computers comprises computers associated with the at least one base station controller(s); computers functioning for network optimization, including at least computers implementing D-SON and C-SON; and, computers functioning for locating wireless devices. There is no requirement that each computer of the system of computers locates a UE.</p> <p>Another portion of the system of computers may be executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution; and operating, implementing and supporting the wireless telecommunications network, corresponds to this claim limitation, as the system of computers executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution receives user's or operator's input specifying a selection between operating in different modes or methods such as signaling-based MDT, management-based MDT, etc. (for example, Signalling Based Immediate MDT, Signalling Based Logged MDT, Management Based Immediate MDT, Management Based Logged MDT, etc.). The following exemplifies this limitation's existence in Accused Systems:</p> <div style="background-color: #e6f2ff; padding: 5px;"> <p>Optimization Use Cases</p> <ul style="list-style-type: none"> [O01] Radio Parameter Optimization: Neighbor cell list optimization [O02] Radio Parameter Optimization: Interference Control [O03] Radio Parameter Optimization: HO parameterization optimization [O04] Radio Parameter Optimization: QoS related parameter optimization [O05] Radio Parameter Optimization: Optimization Scenarios with Home BS/Pico BS [O06] Transport Parameter Optimization: Routing Optimization [O07] Transport Parameter Optimization: Optimization Scenarios with Home BS/Pico BS [O08] Reduction of Energy Consumption [ERO01] Capacity Optimization (Congestion Prime) <p>Maintenance Use Cases</p> <ul style="list-style-type: none"> [Ops01] Hardware / Capacity extension (Easy plug and play hardware replacement) [Ops02] Autonomous Inventory [Ops03] Automatic SW Download to Base Station [Ops04] Automated NEM upgrade [Ops05] Cell outage detection [Ops06] Performance Management in real time [Ops07] Direct KPI reporting in real time [Ops08] Information Correlation for Fault Management [Ops09] Subscriber and Equipment trace [Ops10] Cell Outage Compensation [Ops11] Compensation for Outage of higher level network elements (ASN GW) [Ops12] Fast recovery on instable NEM system [Ops13] Mitigation of outage of units [EROps01] System Availability </div> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 10.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>5.3 LTE1049: MDT - UE Measurement Logs</p> <p>5.3.1 Description of LTE1049: MDT - UE Measurement Logs</p> <p>Introduction to the feature</p> <p>The <i>LTE1049: MDT - UE Measurement Logs</i> feature allows the eNodeB to support the configuration and retrieval of user equipment (UE) measurement logs as well as to report those with a cell trace.</p> <p>...</p> <p>operators. A minimization of drive tests (MDT) has been proposed in order to meet operator requirements. It is a method of collecting the DT data directly from regular UEs used in the network; it is a less expensive approach to DTs. There are two modes of MDT measurements:</p>

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Claim 1	Corresponding Structure in Accused Systems
	<ul style="list-style-type: none"> • logged MDT • immediate MDT <p>The <i>LTE1049: MDT – UE Measurement Logs</i> feature is focused only on the logged MDT measurements mode. The logged MDT is a mode where the UE is able to collect measurements during RRC IDLE state and store them for up to 48 hours. However, the configuration parameters for the logged MDT mode and the logged MDT measurement reports shall be sent when the UE is in the RRC CONNECTED state.</p> <p>There are two independent the logged MDT initiation scenarios :</p> <ul style="list-style-type: none"> • signaling - based activation (SBA) - the operator initiates a subscriber-specific trace session in NetAct or a third-party tool by issuing an MDT trace session activation message towards the core network (CN); it is not in the scope of the feature. • management - based activation (MBA) - the operator initiates an area-based trace session in NetAct, TraceViewer, or the BTSSM by issuing an MDT trace session activation message towards an eNodeB. <p>The operator initiates an area-based trace session in NetAct, TraceViewer, or the BTSSM by issuing an MDT trace session activation message towards an eNodeB. The eNodeB has stored the information that the UE is allowed to perform MDT measurements in RRC IDLE state. After receiving the MDT trace session activation message, the eNodeB starts selecting capable UEs, based on the parameters, and sends them the configuration. When Logged MDT trace session starts, and the UE is in RRC CONNECTED state, it is capable of obtaining the configuration message. Only when the UE is in RRC IDLE state, it is collecting the required measurements and storing them in internal memory. When the UE comes back into RRC CONNECTED state it is able to send collected logs toward the eNodeB.</p> <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 308 and 309.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>The following features are interrelated with the <i>LTE951: Enhanced Cell ID Location Service</i> feature:</p> <ul style="list-style-type: none"> • <i>LTE433: Cell Trace</i> The feature enables operators to simultaneously trace all UEs that are in an RRC_CONNECTED state in a target cell. • <i>LTE644: Configurable Cell Trace Content</i> The feature allows operators to select a message type, based on which the UEs that are in an RRC_CONNECTED state are filtered and traced in a target cell. • <i>LTE163: Subscriber and Equipment Trace</i> The feature enables operators to trace a specific IMSI or IMEI. • <i>LTE782: ANR Fully UE-based</i> Providing the <i>LTE782: ANR Fully UE-based</i> and <i>LTE951: Enhanced Cell ID Location Service</i> features are enabled, the location service measurement request takes higher priority than an ANR measurement. • <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> If the <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> and <i>LTE951: Enhanced Cell ID Location Service</i> features are enabled, the location service measurement request takes higher priority over the measurement requested by the <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> feature. <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 66.</p> <p>Area based MDT: MDT data is collected from UEs in a specified area. The area is defined as a list of cells (UTRAN or E-UTRAN) or as a list of tracking/routing/location areas. The area based MDT is an enhancement of the management based trace functionality. Area based MDT can be either a logged MDT or Immediate MDT.</p> <p>Immediate MDT: Collection of UE measurements in connected mode.</p> <p>Logged MDT: Collection of UE measurements in idle mode.</p> <p>Signalling based MDT: MDT data is collected from one specific UE. The UE that is participating in the MDT data collection is specified as IMEI(SV) or as IMSI. The signalling based MDT is an enhancement of the signalling based subscriber and equipment trace. A signalling based MDT can be either a logged MDT or Immediate MDT.</p>

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Claim 1	Corresponding Structure in Accused Systems														
	<p>Attachment 12 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace control and configuration management (3GPP TS 32.422 version 10.10.0 Release 10) (2013)) at 10.</p> <table><tr><th>Function</th><th>Sub-function</th><th>Tools</th></tr><tr><td rowspan="5">Tracing</td><td>Subscriber and equipment trace</td><td>NetAct TraceViewer</td></tr><tr><td>Cell traffic trace</td><td>NetAct TraceViewer</td></tr><tr><td>Trace-based, real-time monitoring</td><td>Trafica</td></tr><tr><td colspan="2">Sub-function and tool exclusive for LTE Radio Access</td></tr><tr><td>External interface trace</td><td>3rd party analyzer</td></tr></table> <p>Attachment 16 (Monitoring and Measuring System in LTE RAN (2014)) at 9.</p> <p>The <i>Measuring</i> function means collecting and analyzing various performance data. These data are gathered in the form of counters/registers updated when a specified network event occurs. Counters are grouped into administrative entities called <i>measurements</i>, which represent a certain aspect of the performance area. The counter values are viewed locally by using the <i>BTS Performance Monitoring</i> application in the BTS Site Manager or globally by using the NetAct Reporting tools. For information on the measurement administration, collection, storage, and so on, see <i>Performance Management</i>. For information on the performance data content, see <i>LTE Performance Measurements</i>.</p>	Function	Sub-function	Tools	Tracing	Subscriber and equipment trace	NetAct TraceViewer	Cell traffic trace	NetAct TraceViewer	Trace-based, real-time monitoring	Trafica	Sub-function and tool exclusive for LTE Radio Access		External interface trace	3rd party analyzer
Function	Sub-function	Tools													
Tracing	Subscriber and equipment trace	NetAct TraceViewer													
	Cell traffic trace	NetAct TraceViewer													
	Trace-based, real-time monitoring	Trafica													
	Sub-function and tool exclusive for LTE Radio Access														
	External interface trace	3rd party analyzer													

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	<p>Counters are the building blocks for key performance indicators (KPIs). A KPI is basically a formula that consists of one or several counters. These formulas are calculated at NetAct level. The KPIs are used to create top-level reports, which indicate the network performance. For information on the KPI content, see <i>Specifications of LTE RAN Key Performance Indicators</i>.</p> <p>With the NetAct <i>Thresholder and Profiler</i> application, it is possible to define thresholds based on collected counters/KPIs. When this threshold is exceeded, an alarm is raised. For details, see <i>Using NetAct Applications (Report)</i> and <i>Reporter and Performance Management Principles</i> in NetAct operating documentation.</p> <p>The <i>Tracing</i> function in practice means collecting and analyzing trace records that are created for certain calls within a cell or for certain subscribers/equipment. The traced data can be viewed using the NetAct TraceViewer application. For information on the tracing area, see <i>Tracing LTE RAN System</i>. For information on the NetAct TraceViewer application, see <i>Tracing Principles</i> and <i>Tracing Subscribers and Equipment</i> documents in the NetAct documentation. With the introduction of LTE1340: Trace-based Real Time Monitoring feature, the data collected using the cell trace feature can be forwarded to Traffica for visualization. Traffica is a real-time traffic monitoring and analyzing tool that allows the operator to immediately detect network and service failures. Data forwarded to Traffica can be presented as a real time graph (using the Traffica Views client). It can also be stored for further analysis. For information on Traffica, see the <i>Traffica documentation</i>.</p> <p>Attachment 16 (Monitoring and Measuring System in LTE RAN (2014)) at 9.</p>

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Claim 1	Corresponding Structure in Accused Systems																
	<p>4.2 Trace session management</p> <p>4.2.1 Management-based activation</p> <p>The cell traffic trace session is activated/deactivated using the management based-approach. The NetAct TraceViewer triggers the Configurator to generate a delta plan file and to download it to the managed eNBs. The cell trace session starts when the trace session instance (containing the trace parameters) is created.</p> <p>4.2.2 Signaling-based activation</p> <p>With the signaling-based approach, the trace parameters are forwarded to the core network (MME). The MME triggers the subscriber trace session activation by sending the trace parameters (using the signaling interfaces) to the eNB.</p> <p>During handover, the source eNB forwards trace parameters to the target eNB.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 12.</p> <p>2 Trace features</p> <p>Table 1 Trace features shows features related to the trace area.</p> <table border="1"> <thead> <tr> <th>Feature</th><th>Release</th></tr> </thead> <tbody> <tr> <td>LTE163: Subscriber and Equipment Trace</td><td>RL20</td></tr> <tr> <td>LTE433: Cell Trace</td><td>RL20</td></tr> <tr> <td>LTE459: LTE Timing Advance Evaluation</td><td>RL30</td></tr> <tr> <td>LTE644: Configurable cell trace content</td><td>RL30</td></tr> <tr> <td>LTE162: Cell Trace with IMSI</td><td>RL40</td></tr> <tr> <td>LTE953: MDT (Minimization of Drive Test)</td><td>RL40</td></tr> <tr> <td>LTE1340: Trace-based Real Time Monitoring</td><td>RL40</td></tr> </tbody> </table>	Feature	Release	LTE163: Subscriber and Equipment Trace	RL20	LTE433: Cell Trace	RL20	LTE459: LTE Timing Advance Evaluation	RL30	LTE644: Configurable cell trace content	RL30	LTE162: Cell Trace with IMSI	RL40	LTE953: MDT (Minimization of Drive Test)	RL40	LTE1340: Trace-based Real Time Monitoring	RL40
Feature	Release																
LTE163: Subscriber and Equipment Trace	RL20																
LTE433: Cell Trace	RL20																
LTE459: LTE Timing Advance Evaluation	RL30																
LTE644: Configurable cell trace content	RL30																
LTE162: Cell Trace with IMSI	RL40																
LTE953: MDT (Minimization of Drive Test)	RL40																
LTE1340: Trace-based Real Time Monitoring	RL40																

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	<p>...</p> <p>2.1 LTE163: Subscriber and Equipment Trace</p> <p>This feature provides detailed subscriber-oriented information at a call-level for one or more specific UEs. The subscriber and equipment trace supports the tracing of IMSI or IMEI numbers. The traces are activated on demand. The operator can activate subscriber and equipment tracing for a limited period of time for specific analysis purposes, for example, for:</p> <ul style="list-style-type: none"> • root cause determination of a malfunctioning mobile • advanced troubleshooting • optimization of resource usage and quality • RF coverage control and capacity improvement • dropped call analysis • the E2E procedure validation <p>For more details, see LTE163: Subscriber and Equipment Trace.</p> <p>2.2 LTE433: Cell Trace</p> <p>With this feature it is possible to follow the connections ongoing in a cell and verify the intended functionalities within a cell. With the cell trace, all the UEs in a target cell that are in the connected state are traced simultaneously. It can be used for a deeper analysis if problems occur and when various performance measurements do not give a clear indication of the problem. For more details, see LTE433: Cell Trace.</p> <p>...</p>

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	<p>2.5 LTE162: Cell Trace with IMSI</p> <p>With this feature, the existing cell trace data reports can be mapped with the IMSI/IMEI numbers of UEs located in the traced cell. This feature extends the scope of the LTE433: Cell Trace feature. The current LTE433: Cell Trace functionality remains unchanged. For more details, see LTE162: Cell Trace with IMSI.</p> <p>2.6 LTE953: MDT (Minimization of Drive Test)</p> <p>This feature is introduced as an alternative to expensive drive tests performed during network deployment and optimization. It offers a predefined set of MDT profiles available at the NetAct TraceViewer application. The profiles are defined to detect and monitor potential coverage problems. The solution is based on data that is collected using the following features:</p> <ul style="list-style-type: none"> • LTE433: Cell Trace • LTE644: Configurable cell trace content • LTE570: Periodic UE Measurements <p>For more details, see LTE953: MDT (Minimization of Drive Test).</p> <p>2.7 LTE1340: Trace-based Real Time Monitoring</p> <p>This feature introduces a real-time network monitoring solution that is based on:</p> <ul style="list-style-type: none"> • trace data collected from multiple eNBs • L3 Data Collector (L3DC) network element, which in terms of tracing acts as a trace collection entity • Traffica used for visualizing the collected data <p>For more details, see LTE1340: Trace-based Real Time Monitoring.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 8 and 9.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Introduction to LTE trace</p> <p>The LTE trace area consists of the subscriber, equipment trace, and the cell traffic trace, which are network-wide, system-level features. These features are useful for network system maintenance, troubleshooting, and optimization operations. The subscriber and equipment trace provides detailed subscriber-oriented information at a call-level on one or more mobile subscribers or equipment. This feature can be activated for one or more subscribers in the network, using the IMSI/IMEI(SV) number as the identifier. It is activated on user demand for a limited time. The subscriber and equipment trace data can be used to:</p> <ul style="list-style-type: none"> • check how different vendor's UEs are working together in the mobile network or to get detailed information on the observed UE. • check an UE which is not working correctly. • check the radio coverage in a particular network area. • get detailed information on a call-level for troubleshooting. • test the implementation of a new feature before its general deployment, for example, when performing a drive test in the area where the new feature is introduced. • get feedback on the network quality and capacity after optimization operations like the parameter fine-tuning or a network design. <p>The cell traffic trace provides detailed resource-oriented information at a call-level on a defined number of calls in one or more cells. This feature can be activated for specific cells without the UE identification. It is activated on user demand for a limited time. The cell traffic trace data can be used to:</p> <ul style="list-style-type: none"> • check the radio coverage in a particular network area, which helps to avoid drive tests. • get feedback on the network quality and capacity after optimization operations like the parameter fine-tuning or a network design, which helps to avoid drive tests. <p>Attachment 17 (Tracing LTE RAN System (2012)) at 7.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<div><h3>Trace architecture</h3><p>Figure 1 LTE trace architecture shows the architecture of the trace area.</p><p>The diagram illustrates the LTE trace architecture. It includes the following components and their interactions:</p><ul style="list-style-type: none">3rd party analyzer (yellow box): Receives trace reports from the Security gateway via a blue arrow.NetAct TraceViewer (grey box): Receives management-based activation from the iOMS (red arrow) and sends trace reports to the 3rd party analyzer (blue arrow). It also receives signaling-based activation from the MME (green arrow).3rd party O&M (yellow box): Sends signaling-based activation to the MME (green arrow).iOMS Trace Data (grey box with database icon): Receives management-based activation from the NetAct TraceViewer (red arrow) and sends it to the Security gateway (red arrow). It also receives trace reports from the Security gateway (blue arrow).Security gateway (grey box): Receives management-based activation from the iOMS (red arrow) and sends it to the eNB (red arrow). It also receives trace reports from the eNB (blue arrow) and sends them to the 3rd party analyzer (blue arrow).eNB Trace Data (grey box with database icon): Receives management-based activation from the Security gateway (red arrow) and sends it to the iOMS (red arrow). It also receives trace reports from the iOMS (blue arrow).MME (orange triangle with 'X'): Receives signaling-based activation from the 3rd party O&M (green arrow) and sends it to the NetAct TraceViewer (green arrow).Socket connection TCP over IPSec (dashed line): Connects the eNB and the iOMS.<p>Legend:</p><ul style="list-style-type: none">Red arrow: Management-based activationGreen arrow: Signaling-based activationBlue arrow: Trace reports transfer<p>Figure 1 LTE trace architecture</p><p>Attachment 17 (Tracing LTE RAN System (2012)) at 10.</p></div>

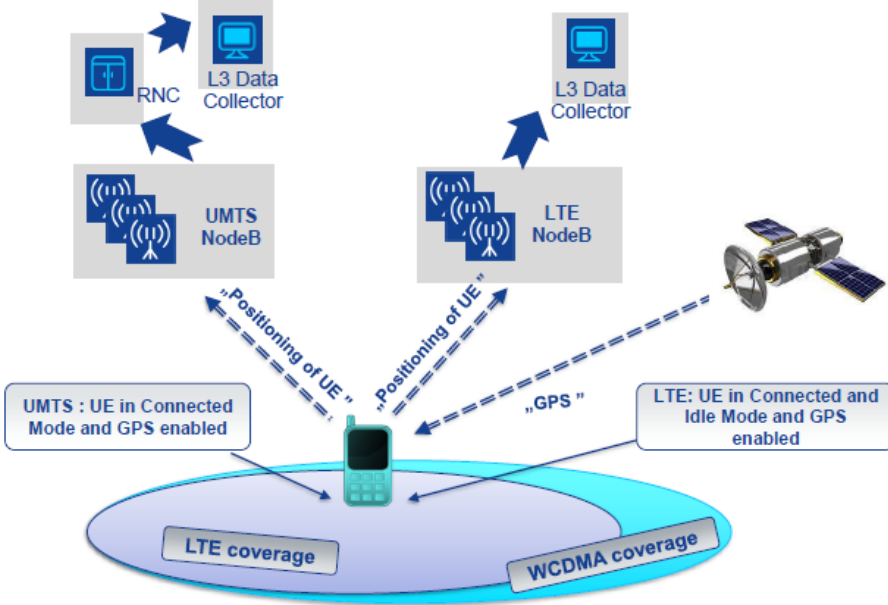
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	<p>NetAct TraceViewer</p> <p>The TraceViewer provides a GUI interface for trace feature and trace session configuration. The TraceViewer generates (using the Configurator) a delta plan file containing the configuration parameters of the trace control objects. It triggers the download of this delta plan file to the NEs. In case of signaling-based subscriber and equipment trace activation, the TraceViewer forwards the trace parameters to the core network. In case of management-based cell traffic trace activation, it creates the trace session object instance for each traced cell.</p> <p>TraceViewer is responsible for post processing and presentation of the trace results.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 11.</p> <p>6.1.1 MDT - UE measurement logs</p> <p>Unique ID: 1049</p> <p>Short Description:</p> <p>The eNode B supports the configuration and the retrieval of UE measurement logs.</p> <p>Benefits for the Customer:</p> <p>The UE measurement log function can be used to minimize the drive test effort.</p> <p>Functional Description:</p> <p>The Flexi Multiradio BTS supports the handling of UE measurement logs.</p> <p>The feature comprises of</p> <ul style="list-style-type: none"> • configuration of UE measurement logs and • retrieval of UE measurement logs.

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Claim 1	Corresponding Structure in Accused Systems
	<p><u>Content of UE measurement log:</u></p> <p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (GNSS information is optional for the UE) • time stamp • serving cell ID • serving cell measurements (RSRP, RSRQ) • neighbor cell measurements (RSRP, RSRQ, RSCP, Ec/N0, RxLev,...) <p>The UE collects the measurement data during RRC IDLE and stores is up to 48 hours. The maximum log size is 520 entries. The support of this functionality is optional for 3GPP R10 UEs.</p> <div style="border: 1px solid red; padding: 5px;"> <p>The configuration of UE measurement logs and the retrieval of measurement logs is applied only for UEs with related UE capabilities and with according settings of the IE 'Management based MDT allowed' in case of cell trace or UEs selected by the MME in case of subscriber trace. The IE 'Management based MDT allowed' is received either via S1 and X2, e.g. at initial UE context setup or during handover. The IE is forwarded during X2 handover.</p> </div> <p>Attachment 18 (LTE RAN Release RL70 Feature Candidate Document (2013)) at 42.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p style="text-align: center;">Positioning information source (3GPP TS 37.320)</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>UMTS</p> <ul style="list-style-type: none"> The feature RAN2496 (RU50) enables sending periodic GPS measurements locations of UE, supporting UE-Based reporting during CS/PS connection. Only UEs in Cell_DCH state (Immediate MDT) will report measurements Periodicity from 2 to 32 s Measurements are contained in measurements report between UE and RNC and it possible to correlate this information with other events (RSCP, Ec/N0, etc.) <p>LTE</p> <ul style="list-style-type: none"> Immediate MDT: LTE1308 (LTE16) enables GPS periodic position identification of UEs via Cell trace interface eNB in connected mode. <ul style="list-style-type: none"> The information can be correlated to other network events or UE using call trace Reporting interval from 120 ms to 60 min Logged MDT: LTE 1049 (LTE15A) enables GPS periodic position identification with radio information of UEs in idle Mode. <ul style="list-style-type: none"> Logging interval from 1.280 to 61.440 s Logging duration from 10 to 120 min </div> <div style="width: 50%;"> <p>GPS reporting capability of UE from real networks: UMTS: 20 ÷ 25% LTE: 3 ÷ 5%</p>  <p>The diagram illustrates the positioning information source. It shows a mobile device at the bottom, connected to two networks: UMTS (left) and LTE (right). The UMTS network includes an RNC and a UMTS NodeB. The LTE network includes an L3 Data Collector and an LTE NodeB. A satellite is shown on the right, providing GPS coverage. The device is shown in two states: 'UMTS : UE in Connected Mode and GPS enabled' and 'LTE: UE in Connected and Idle Mode and GPS enabled'. The device is also shown in 'WCDMA coverage' and 'LTE coverage' areas. Arrows indicate 'Positioning of UE' from the device to the RNC and 'Positioning of UE' from the device to the L3 Data Collector. A dashed arrow labeled 'GPS' points from the satellite to the device.</p> </div> </div> <p style="text-align: right;">NOKIA</p> <p>Attachment 13 (Minimization of Drive Test (MDT) An Innovative Methodology for Measuring Customer Performance on Mobile Network (2016)) at 5.</p>
<p>wherein the system of computers, responsive to selection of the active mode, receives a second user input</p>	<p>Plaintiff contends that a system of computers comprises wireless device location elements, including but not limited to one or more of position determination entities (PDE), mobile location/positioning centers, mobile switching center, location proxy servers, locations applications, location agents, GPS server, Wi-Fi server, home location register, visiting location register, one or more of which are used in locating a wireless device. The various location elements are Nokia components, Nokia subsidiaries or family of companies, vendors, partners and the like. The various location elements are meant to work across one or more of all technologies, including 2G, 3G, 4G, and 5G. The system of computers can be toggled or switched between an active mode and a passive mode for tracking a wireless device.</p>

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<p>specifying the at least one mobile wireless communications device to track and a time period to track the at least one mobile wireless communications device and generates a case file containing locations of the at least one mobile wireless communications device over the specified time period, and</p>	<p>Plaintiff contends that the user or operator by using another portion of the system of computers that may be executing or loaded with Nokia Eden-Net (or Nokia iSON or Nokia NetAct) solution can specify at least one mobile wireless communications device to track as well as a time period to track the at least one mobile wireless communications device by selecting methods such as signaling-based MDT, management-based MDT, etc. Further, a file or a record is generated containing location(s) of the at least one mobile wireless communications device for the specified time period.</p> <p>The following exemplifies this limitation's existence in Accused Systems:</p> <p>6.1.1 MDT - UE measurement logs</p> <p>Unique ID: 1049</p> <p>Short Description:</p> <p>The eNode B supports the configuration and the retrieval of UE measurement logs.</p> <p>Benefits for the Customer:</p> <p>The UE measurement log function can be used to minimize the drive test effort.</p> <p>Functional Description:</p> <p>The Flexi Multiradio BTS supports the handling of UE measurement logs.</p> <p>The feature comprises of</p> <ul style="list-style-type: none"> • configuration of UE measurement logs and • retrieval of UE measurement logs.

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Claim 1	Corresponding Structure in Accused Systems
	<p><u>Content of UE measurement log:</u></p> <div style="border: 1px solid red; padding: 10px;"> <p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (GNSS information is optional for the UE) • time stamp • serving cell ID • serving cell measurements (RSRP, RSRQ) • neighbor cell measurements (RSRP, RSRQ, RSCP, Ec/N0, RxLev,...) <p>The UE collects the measurement data during RRC IDLE and stores is up to 48 hours. The maximum log size is 520 entries. The support of this functionality is optional for 3GPP R10 UEs.</p> <p>The configuration of UE measurement logs and the retrieval of measurement logs is applied only for UEs with related UE capabilities and with according settings of the IE 'Management based MDT allowed' in case of cell trace or UEs selected by the MME in case of subscriber trace. The IE 'Management based MDT allowed' is received either via S1 and X2, e.g. at initial UE context setup or during handover. The IE is forwarded during X2 handover.</p> </div> <p>Attachment 18 (LTE RAN Release RL70 Feature Candidate Document (2013)) at 42.</p> <p>5.3 LTE1049: MDT - UE Measurement Logs</p> <p>5.3.1 Description of LTE1049: MDT - UE Measurement Logs</p> <p>Introduction to the feature</p> <p>The <i>LTE1049: MDT - UE Measurement Logs</i> feature allows the eNodeB to support the configuration and retrieval of user equipment (UE) measurement logs as well as to report those with a cell trace.</p> <p>...</p> <p>operators. A minimization of drive tests (MDT) has been proposed in order to meet operator requirements. It is a method of collecting the DT data directly from regular UEs used in the network; it is a less expensive approach to DTs. There are two modes of MDT measurements:</p>

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Claim 1	Corresponding Structure in Accused Systems
	<ul style="list-style-type: none"> • logged MDT • immediate MDT <p>The <i>LTE1049: MDT – UE Measurement Logs</i> feature is focused only on the logged MDT measurements mode. The logged MDT is a mode where the UE is able to collect measurements during RRC IDLE state and store them for up to 48 hours. However, the configuration parameters for the logged MDT mode and the logged MDT measurement reports shall be sent when the UE is in the RRC CONNECTED state.</p> <p>There are two independent the logged MDT initiation scenarios :</p> <ul style="list-style-type: none"> • signaling - based activation (SBA) - the operator initiates a subscriber-specific trace session in NetAct or a third-party tool by issuing an MDT trace session activation message towards the core network (CN); it is not in the scope of the feature. • management - based activation (MBA) - the operator initiates an area-based trace session in NetAct, TraceViewer, or the BTSSM by issuing an MDT trace session activation message towards an eNodeB. <p>The operator initiates an area-based trace session in NetAct, TraceViewer, or the BTSSM by issuing an MDT trace session activation message towards an eNodeB. The eNodeB has stored the information that the UE is allowed to perform MDT measurements in RRC IDLE state. After receiving the MDT trace session activation message, the eNodeB starts selecting capable UEs, based on the parameters, and sends them the configuration. When Logged MDT trace session starts, and the UE is in RRC CONNECTED state, it is capable of obtaining the configuration message. Only when the UE is in RRC IDLE state, it is collecting the required measurements and storing them in internal memory. When the UE comes back into RRC CONNECTED state it is able to send collected logs toward the eNodeB.</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (global navigation satellite system (GNSS) information is optional for the UE) • time stamp • serving cell ID • serving cell measurements • neighbor cell measurements <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 308 and 309.</p> <p>The following features are interrelated with the <i>LTE951: Enhanced Cell ID Location Service</i> feature:</p> <ul style="list-style-type: none"> • <i>LTE433: Cell Trace</i> The feature enables operators to simultaneously trace all UEs that are in an RRC_CONNECTED state in a target cell. • <i>LTE644: Configurable Cell Trace Content</i> The feature allows operators to select a message type, based on which the UEs that are in an RRC_CONNECTED state are filtered and traced in a target cell. • <i>LTE163: Subscriber and Equipment Trace</i> The feature enables operators to trace a specific IMSI or IMEI. • <i>LTE782: ANR Fully UE-based</i> Providing the <i>LTE782: ANR Fully UE-based</i> and <i>LTE951: Enhanced Cell ID Location Service</i> features are enabled, the location service measurement request takes higher priority than an ANR measurement. • <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> If the <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> and <i>LTE951: Enhanced Cell ID Location Service</i> features are enabled, the location service measurement request takes higher priority over the measurement requested by the <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> feature. <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 66.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Area based MDT: MDT data is collected from UEs in a specified area. The area is defined as a list of cells (UTRAN or E-UTRAN) or as a list of tracking/routing/location areas. The area based MDT is an enhancement of the management based trace functionality. Area based MDT can be either a logged MDT or Immediate MDT.</p> <p>Immediate MDT: Collection of UE measurements in connected mode.</p> <p>Logged MDT: Collection of UE measurements in idle mode.</p> <p>Signalling based MDT MDT data is collected from one specific UE. The UE that is participating in the MDT data collection is specified as IMEI(SV) or as IMSI. The signalling based MDT is an enhancement of the signalling based subscriber and equipment trace. A signalling based MDT can be either a logged MDT or Immediate MDT.</p> <p>Attachment 12 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace control and configuration management (3GPP TS 32.422 version 10.10.0 Release 10) (2013)) at 10.</p> <p>4.5 Reporting types</p> <p>There are two basic types of trace data reporting:</p> <ul style="list-style-type: none"> • online-based • file-based <p>The trace reporting mode can be set for all trace sessions of the same trace type (subscriber trace, cell traffic trace) within one NE. That means, for example, that once the trace reporting mode for subscriber trace is set to <i>online trace reporting</i>, the trace reports for all subscriber trace sessions from a particular NE will be sent online. For trace data reporting to an external IP address, only the online-based reporting is applied, even if the trace reporting mode is set to <i>file based</i> for this NE.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>4.5.1 Online-based reporting</p> <p>The trace reports are generated for each trace session periodically. This means that each trace report may contain several trace records of the same trace session. The iOMS is responsible for forwarding the trace reports to NetAct TraceViewer as NWI3 observation event reports. The TraceViewer supports online evaluation and presentation of the trace results.</p> <p>For online trace reporting, the trace data can be sent to NetAct or to an external IP address.</p> <p>4.5.2 File-based reporting</p> <p>The trace records are stored in trace log files, which are stored in iOMS. They are uploaded to NetAct TraceViewer at the end of each trace session or if the maximum file size is reached.</p> <p>For subscriber and equipment trace, one trace log file is generated for each traced subscriber and trace session. All trace records from same subscriber in same trace session are stored in the same trace log file.</p> <p>For cell traffic trace, one trace log file is generated for each traced cell and each trace session. All trace records of all traced connection within the same trace session are stored in the same trace log file. To avoid sending big trace log files, a maximum file size is defined. If the maximum file size is reached, the iOMS closes the trace log file and generates a new one for trace records storage. At the end of trace session or in case the maximum file size is reached, the iOMS triggers the NetAct TraceViewer (using the NWI3 FilesReadyEvent message) to upload the trace log files.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 18.</p>

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Claim 1	Corresponding Structure in Accused Systems		
	Function	Sub-function	Tools
	Tracing	Subscriber and equipment trace	NetAct TraceViewer
		Cell traffic trace Trace-based, real-time monitoring	NetAct TraceViewer
			Trafica
		Sub-function and tool exclusive for LTE Radio Access	
		External interface trace	3rd party analyzer
	<p>Attachment 16 (Monitoring and Measuring System in LTE RAN (2014)) at 9.</p> <p>The <i>Tracing</i> function in practice means collecting and analyzing trace records that are created for certain calls within a cell or for certain subscribers/equipment. The traced data can be viewed using the NetAct TraceViewer application. For information on the tracing area, see <i>Tracing LTE RAN System</i>. For information on the NetAct TraceViewer application, see <i>Tracing Principles</i> and <i>Tracing Subscribers and Equipment</i> documents in the NetAct documentation. With the introduction of LTE1340: Trace-based Real Time Monitoring feature, the data collected using the cell trace feature can be forwarded to Trafica for visualization. Trafica is a real-time traffic monitoring and analyzing tool that allows the operator to immediately detect network and service failures. Data forwarded to Trafica can be presented as a real time graph (using the Trafica Views client). It can also be stored for further analysis. For information on Trafica, see the <i>Trafica documentation</i>.</p> <p>Attachment 16 (Monitoring and Measuring System in LTE RAN (2014)) at 9.</p>		

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Claim 1	Corresponding Structure in Accused Systems
	<p>This is an overview of basic terms related to the trace function:</p> <ul style="list-style-type: none"> • <i>Trace session</i> - a time interval between the trace session activation and deactivation. • <i>Trace Recording Session</i> - a time interval within a trace session when trace records, triggered by defined events, are generated for the subscriber. • <i>Trace Recording Session Reference</i> - it uniquely identifies the trace recording session within a trace session. It is included in each trace record. • <i>Trace Record</i> - a set of collected traceable data. For each traced event, one trace record is generated. Several trace records can be generated during a trace recording session. • <i>Trace Report</i> - a specified number of trace records collected together and sent to the trace collection entity. • <i>Trace Collection Entity</i> - a network-wide trace data collection entity where the trace reports from the NEs are sent to. The TraceViewer application acts as the trace collection entity. <p>...</p> <p>4.2 Trace session management</p> <p>4.2.1 Management-based activation</p> <p>The cell traffic trace session is activated/deactivated using the management based-approach. The NetAct TraceViewer triggers the Configurator to generate a delta plan file and to download it to the managed eNBs. The cell trace session starts when the trace session instance (containing the trace parameters) is created.</p> <p>4.2.2 Signaling-based activation</p> <p>With the signaling-based approach, the trace parameters are forwarded to the core network (MME). The MME triggers the subscriber trace session activation by sending the trace parameters (using the signaling interfaces) to the eNB.</p> <p>During handover, the source eNB forwards trace parameters to the target eNB.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 12.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>2.1 LTE163: Subscriber and Equipment Trace</p> <p>This feature provides detailed subscriber-oriented information at a call-level for one or more specific UEs. The subscriber and equipment trace supports the tracing of IMSI or IMEI numbers. The traces are activated on demand. The operator can activate subscriber and equipment tracing for a limited period of time for specific analysis purposes, for example, for:</p> <ul style="list-style-type: none"> • root cause determination of a malfunctioning mobile • advanced troubleshooting • optimization of resource usage and quality • RF coverage control and capacity improvement • dropped call analysis • the E2E procedure validation <p>For more details, see LTE163: Subscriber and Equipment Trace.</p> <p>2.2 LTE433: Cell Trace</p> <p>With this feature it is possible to follow the connections ongoing in a cell and verify the intended functionalities within a cell. With the cell trace, all the UEs in a target cell that are in the connected state are traced simultaneously. It can be used for a deeper analysis if problems occur and when various performance measurements do not give a clear indication of the problem. For more details, see LTE433: Cell Trace.</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>2.5 LTE162: Cell Trace with IMSI</p> <p>With this feature, the existing cell trace data reports can be mapped with the IMSI/IMEI numbers of UEs located in the traced cell. This feature extends the scope of the LTE433: Cell Trace feature. The current LTE433: Cell Trace functionality remains unchanged. For more details, see LTE162: Cell Trace with IMSI.</p> <p>2.6 LTE953: MDT (Minimization of Drive Test)</p> <p>This feature is introduced as an alternative to expensive drive tests performed during network deployment and optimization. It offers a predefined set of MDT profiles available at the NetAct TraceViewer application. The profiles are defined to detect and monitor potential coverage problems. The solution is based on data that is collected using the following features:</p> <ul style="list-style-type: none"> • LTE433: Cell Trace • LTE644: Configurable cell trace content • LTE570: Periodic UE Measurements <p>For more details, see LTE953: MDT (Minimization of Drive Test).</p> <p>2.7 LTE1340: Trace-based Real Time Monitoring</p> <p>This feature introduces a real-time network monitoring solution that is based on:</p> <ul style="list-style-type: none"> • trace data collected from multiple eNBs • L3 Data Collector (L3DC) network element, which in terms of tracing acts as a trace collection entity • Traffica used for visualizing the collected data <p>For more details, see LTE1340: Trace-based Real Time Monitoring.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 8 and 9.</p>

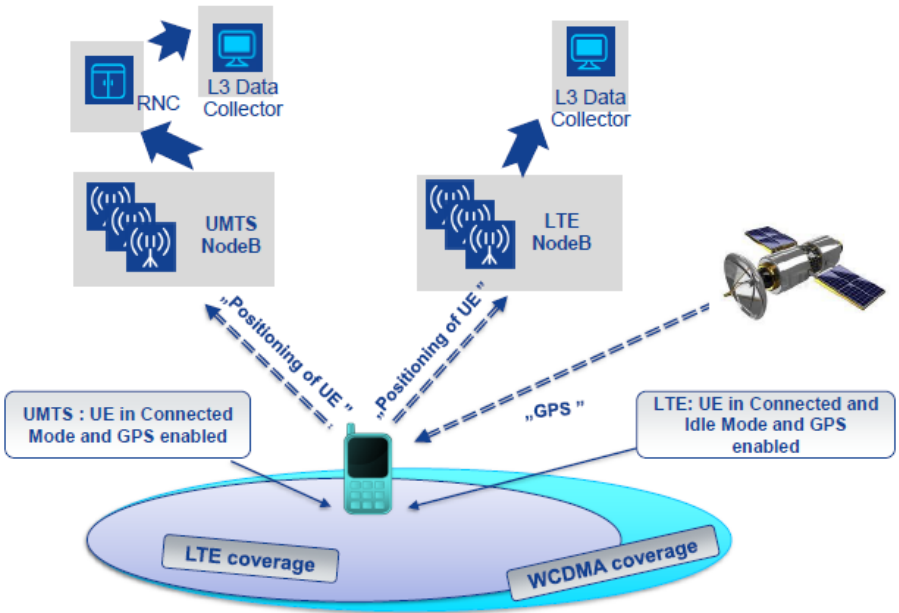
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Claim 1	Corresponding Structure in Accused Systems
	<p>Introduction to LTE trace</p> <p>The LTE trace area consists of the subscriber, equipment trace, and the cell traffic trace, which are network-wide, system-level features. These features are useful for network system maintenance, troubleshooting, and optimization operations. The subscriber and equipment trace provides detailed subscriber-oriented information at a call-level on one or more mobile subscribers or equipment. This feature can be activated for one or more subscribers in the network, using the IMSI/IMEI(SV) number as the identifier. It is activated on user demand for a limited time. The subscriber and equipment trace data can be used to:</p> <ul style="list-style-type: none"> • check how different vendor's UEs are working together in the mobile network or to get detailed information on the observed UE. • check an UE which is not working correctly. • check the radio coverage in a particular network area. • get detailed information on a call-level for troubleshooting. • test the implementation of a new feature before its general deployment, for example, when performing a drive test in the area where the new feature is introduced. • get feedback on the network quality and capacity after optimization operations like the parameter fine-tuning or a network design. <p>The cell traffic trace provides detailed resource-oriented information at a call-level on a defined number of calls in one or more cells. This feature can be activated for specific cells without the UE identification. It is activated on user demand for a limited time. The cell traffic trace data can be used to:</p> <ul style="list-style-type: none"> • check the radio coverage in a particular network area, which helps to avoid drive tests. • get feedback on the network quality and capacity after optimization operations like the parameter fine-tuning or a network design, which helps to avoid drive tests. <p>Attachment 17 (Tracing LTE RAN System (2012)) at 7.</p>


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Claim 1	Corresponding Structure in Accused Systems
	<p>NetAct TraceViewer</p> <p>The TraceViewer provides a GUI interface for trace feature and trace session configuration. The TraceViewer generates (using the Configurator) a delta plan file containing the configuration parameters of the trace control objects. It triggers the download of this delta plan file to the NEs. In case of signaling-based subscriber and equipment trace activation, the TraceViewer forwards the trace parameters to the core network. In case of management-based cell traffic trace activation, it creates the trace session object instance for each traced cell.</p> <p>TraceViewer is responsible for post processing and presentation of the trace results.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 11.</p> <p>Drive test minimization</p> <p>The data collected using the trace features is valuable during certain troubleshooting and monitoring activities. During network deployment or expansion, some tests might require on-site verification (for example, monitoring the coverage quality). The <i>LTE953</i>: MDT (Minimization of Drive Test) feature is introduced as an alternative to expensive on-site tests. This feature offers a predefined set of profiles available in NetAct TraceViewer. When a profile is started for a certain cell, a set of data related to this particular cell is collected and stored. The profiles are designed to help with coverage problem detection and to monitor the coverage quality. The solution is based on data collected using the trace features and the periodic UE measurements. For more information, see <i>LTE953: MDT (Minimization of Drive Test)</i>.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 16 and 17.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p style="text-align: center;">Positioning information source (3GPP TS 37.320)</p> <div style="display: flex; justify-content: space-between;"> <div data-bbox="415 313 976 1060" style="width: 45%;"> <p>UMTS</p> <ul style="list-style-type: none"> The feature RAN2496 (RU50) enables sending periodic GPS measurements locations of UE, supporting UE-Based reporting during CS/PS connection. Only UEs in Cell_DCH state (Immediate MDT) will report measurements Periodicity from 2 to 32 s Measurements are contained in measurements report between UE and RNC and it possible to correlate this information with other events (RSCP, Ec/N0, etc.) <p>LTE</p> <ul style="list-style-type: none"> Immediate MDT: LTE1308 (LTE16) enables GPS periodic position identification of UEs via Cell trace interface eNB in connected mode. <ul style="list-style-type: none"> The information can be correlated to other network events or UE using call trace Reporting interval from 120 ms to 60 min Logged MDT: LTE 1049 (LTE15A) enables GPS periodic position identification with radio information of UEs in idle Mode. <ul style="list-style-type: none"> Logging interval from 1.280 to 61.440 s Logging duration from 10 to 120 min </div> <div data-bbox="1039 289 1932 1047" style="width: 50%;"> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 10px;"> GPS reporting capability of UE from real networks: UMTS: 20 ÷ 25% LTE: 3 ÷ 5% </div>  <p>The diagram illustrates the positioning information source architecture. It shows two network paths: UMTS and LTE. The UMTS path includes an RNC (Radio Network Controller) connected to an L3 Data Collector and a UMTS NodeB. The LTE path includes an L3 Data Collector and an LTE NodeB. A mobile device (UE) is shown at the bottom, connected to both networks. The device is also connected to a GPS satellite. The device is shown in two states: 'UMTS : UE in Connected Mode and GPS enabled' and 'LTE: UE in Connected and Idle Mode and GPS enabled'. The device is shown in two coverage areas: 'LTE coverage' and 'WCDMA coverage'. The device is shown in two states: 'Positioning of UE' and 'GPS'.</p> </div> </div> <p style="text-align: center;">5</p> <p style="text-align: center;">Confidential © Nokia 2016</p> <p style="text-align: right;">NOKIA</p> <p>Attachment 13 (Minimization of Drive Test (MDT) An Innovative Methodology for Measuring Customer Performance on Mobile Network (2016)) at 5.</p> <h3>3.1 Definitions</h3> <p>For the purposes of the present document, the terms and definitions given in 21.905 [8] and the following apply:</p> <p>Cell Traffic Trace: The ability to trace one or more active calls in one or more cells.</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>management activation/deactivation: Trace Session is activated/deactivated in different NEs directly from the EM using the management interfaces of those NEs.</p> <p>MDT Measurements: See 3GPP TS 37.320 [11].</p> <p>Signalling Based Activation/Deactivation: Trace Session is activated/deactivated in different NEs using the signalling interfaces between those elements so that the NEs may forward the activation/deactivation originating from the EM</p> <p>...</p> <p>Trace: general term used for Subscriber and Equipment Trace.</p> <p>Trace record: in the NE a Trace record is a set of Traceable data collected as determined by the Trace control and configuration parameters.</p> <p>Trace Recording Session: time interval within a Trace Session while trace records are generated for the Subscriber or UE being traced. The triggering events starting and stopping a Trace Recording Session are defined in 3GPP TS 32.422 [2] (see figure 1).</p> <p>Trace Recording Session Reference: identifies a Trace Recording Session within a Trace Session (see figure 1)</p> <p>...</p> <p>Trace Reference: identifies a Trace Session and is globally unique (see figure 2)</p> <p>Trace Session: time interval started with a Trace Session Activation and lasts until the Deactivation of that specific Trace Session (see figure 2)</p> <div style="text-align: center; margin-top: 20px;"> <div style="display: flex; justify-content: space-around;"> <div style="text-align: left;"> <p>Activation</p> <ul style="list-style-type: none"> - IMSI or IMEI(SV) or Public ID - Trace Reference - Trace control and configuration parameters </div> <div style="text-align: right;"> <p>Deactivation</p> <ul style="list-style-type: none"> - Trace Reference </div> </div>  <p style="text-align: center;">Figure 2: Trace Session</p> </div>

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Claim 1	Corresponding Structure in Accused Systems
	<p>Trace Parameter Configuration: a technique whereby a request for tracing a certain Subscriber, UE or Service is sent by the EM to the NE for execution.</p> <p>Attachment 11 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements (3GPP TS 32.421 version 10.6.0 Release 10) (2013)) at 8 and 9.</p> <p>Subscriber and equipment trace provide very detailed information at call level on one or more specific mobile(s). This data is an additional source of information to Performance Measurements and allows going further in monitoring and optimisation operations.</p> <p>Contrary to Performance measurements, which are a permanent source of information, trace is activated on user demand for a limited period of time for specific analysis purposes.</p> <p>Trace plays a major role in activities such as determination of the root cause of a malfunctioning mobile, advanced troubleshooting, optimisation of resource usage and quality, RF coverage control and capacity improvement, dropped call analysis, Core Network and UTRAN end-to-end UMTS procedure validation.</p> <p>The capability to log data on any interface at call level for a specific user (e.g. IMSI) or mobile type (e.g. IMEI or IMEISV) allows getting information which cannot be deduced from Performance measurements such as perception of end-user QoS during his call (e.g. requested QoS vs. provided QoS), correlation between protocol messages and RF measurements, or interoperability with specific mobile vendors.</p> <p>Moreover, performance measurements provide values aggregated on an observation period; Subscriber and UE Trace give instantaneous values for a specific event (e.g. call, location update, etc.).</p> <p>If performance measurements are mandatory for daily operations, future network planning and primary trouble shooting; Subscriber and UE Trace is the easy way to go deeper into investigation and UMTS network optimisation.</p> <p>In order to produce this data, Subscriber and UE Trace are carried out in the NEs, which comprise the network. The data can then be transferred to an external system (e.g. an Operations System (OS) in TMN terminology, for further evaluation).</p> <p>Attachment 11 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements (3GPP TS 32.421 version 10.6.0 Release 10) (2013)) at 6.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>The high level requirements for Trace Data reporting, common to both Management activation/deactivation and Signalling Based Activation/Deactivation, are as follows (Trace record contents, file formats and file transfer mechanisms are defined in 3GPP TS 32.423 [3]):</p> <ul style="list-style-type: none"> - Trace records should be generated in each NE where a Trace Session has been activated and a Trace Recording Session has been started. - Format of the Trace records sent over Itf-N shall be XML based on the Schema in TS 32.423 [3]. - Trace records should be transferred on the Itf-N to the Network Manager using one of two approaches: direct transfer from NE to NM or transfer from NE to NM via EM. - Trace records may also be transferred to an external IP address (received in Trace Control and Configuration Parameters) in 3 ways: <ul style="list-style-type: none"> 1. Direct transfer from NE to IP address 2. Transfer from NE to IP address via EM 3. Transfer from NE to EM. The EM notifies the holder of the IP address that collects the files. <p>For transfer of Trace records via Itf-N, FTP or secure FTP shall be used.</p> <p>Attachment 11 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements (3GPP TS 32.421 version 10.6.0 Release 10) (2013)) at 22.</p>
<p>wherein the system of computers, responsive to selection of the passive mode, receives a third user input specifying at least one sector and an</p>	<p>Plaintiff contends that a system of computers comprises wireless device location elements, including but not limited to one or more of position determination entities (PDE), mobile location/positioning centers, mobile switching center, location proxy servers, locations applications, location agents, GPS server, Wi-Fi server, home location register, visiting location register, one or more of which are used in locating a wireless device. The various location elements are Nokia components, Nokia subsidiaries or family of companies, vendors, partners and the like. The various location elements are meant to work across one or more of all technologies, including 2G, 3G, 4G, and 5G. The system of computers can be toggled or switched between an active mode and a passive mode for tracking a wireless device.</p> <p>Plaintiff further contends that the another portion of the system of computers that may be executing or loaded with Nokia Eden-</p>

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Claim 1	Corresponding Structure in Accused Systems
<p>error criteria to use in conjunction with generating the case file.</p>	<p>Net (or Nokia iSON or Nokia NetAct) solution can receive user input specifying at least one sector (for example, by selecting methods such as Management based MDT, Area based MDT, etc.) as well as an error criteria to use in conjunction with generating the case file.</p> <p>The following exemplifies this limitation's existence in Accused Systems:</p> <p>Area based MDT: MDT data is collected from UEs in a specified area. The area is defined as a list of cells (UTRAN or E-UTRAN) or as a list of tracking/routing/location areas. The area based MDT is an enhancement of the management based trace functionality. Area based MDT can be either a logged MDT or Immediate MDT.</p> <p>Immediate MDT: Collection of UE measurements in connected mode.</p> <p>Logged MDT: Collection of UE measurements in idle mode.</p> <p>Attachment 12 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace control and configuration management (3GPP TS 32.422 version 10.10.0 Release 10) (2013)) at 10.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>6.1.1 MDT - UE measurement logs</p> <p>Unique ID: 1049</p> <p>Short Description:</p> <p>The eNode B supports the configuration and the retrieval of UE measurement logs.</p> <p>Benefits for the Customer:</p> <p>The UE measurement log function can be used to minimize the drive test effort.</p> <p>Functional Description:</p> <p>The Flexi Multiradio BTS supports the handling of UE measurement logs.</p> <p>The feature comprises of</p> <ul style="list-style-type: none"> • configuration of UE measurement logs and • retrieval of UE measurement logs.

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Claim 1	Corresponding Structure in Accused Systems
	<p><u>Content of UE measurement log:</u></p> <p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (GNSS information is optional for the UE) • time stamp • serving cell ID • serving cell measurements (RSRP, RSRQ) • neighbor cell measurements (RSRP, RSRQ, RSCP, Ec/N0, RxLev,...) <p>The UE collects the measurement data during RRC IDLE and stores is up to 48 hours. The maximum log size is 520 entries. The support of this functionality is optional for 3GPP R10 UEs.</p> <p>The configuration of UE measurement logs and the retrieval of measurement logs is applied only for UEs with related UE capabilities and with according settings of the IE Management based MDT allowed in case of cell trace or UEs selected by the MME in case of subscriber trace. The IE 'Management based MDT allowed' is received either via S1 and X2, e.g. at initial UE context setup or during handover. The IE is forwarded during X2 handover.</p> <p>Attachment 18 (LTE RAN Release RL70 Feature Candidate Document (2013)) at 42.</p> <p>5.3 LTE1049: MDT - UE Measurement Logs</p> <p>5.3.1 Description of LTE1049: MDT - UE Measurement Logs</p> <p>Introduction to the feature</p> <p>The <i>LTE1049: MDT - UE Measurement Logs</i> feature allows the eNodeB to support the configuration and retrieval of user equipment (UE) measurement logs as well as to report those with a cell trace.</p> <p>...</p> <p>operators. A minimization of drive tests (MDT) has been proposed in order to meet operator requirements. It is a method of collecting the DT data directly from regular UEs used in the network; it is a less expensive approach to DTs. There are two modes of MDT measurements:</p>

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Claim 1	Corresponding Structure in Accused Systems
	<ul style="list-style-type: none"> • logged MDT • immediate MDT <p>The <i>LTE1049: MDT – UE Measurement Logs</i> feature is focused only on the logged MDT measurements mode. The logged MDT is a mode where the UE is able to collect measurements during RRC IDLE state and store them for up to 48 hours. However, the configuration parameters for the logged MDT mode and the logged MDT measurement reports shall be sent when the UE is in the RRC CONNECTED state.</p> <p>There are two independent the logged MDT initiation scenarios :</p> <ul style="list-style-type: none"> • signaling - based activation (SBA) - the operator initiates a subscriber-specific trace session in NetAct or a third-party tool by issuing an MDT trace session activation message towards the core network (CN); it is not in the scope of the feature. • management - based activation (MBA) - the operator initiates an area-based trace session in NetAct, TraceViewer, or the BTSSM by issuing an MDT trace session activation message towards an eNodeB. <p>The operator initiates an area-based trace session in NetAct, TraceViewer, or the BTSSM by issuing an MDT trace session activation message towards an eNodeB. The eNodeB has stored the information that the UE is allowed to perform MDT measurements in RRC IDLE state. After receiving the MDT trace session activation message, the eNodeB starts selecting capable UEs, based on the parameters, and sends them the configuration. When Logged MDT trace session starts, and the UE is in RRC CONNECTED state, it is capable of obtaining the configuration message. Only when the UE is in RRC IDLE state, it is collecting the required measurements and storing them in internal memory. When the UE comes back into RRC CONNECTED state it is able to send collected logs toward the eNodeB.</p> <p>...</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>The UE measurement logs contain the following information:</p> <ul style="list-style-type: none"> • location info (global navigation satellite system (GNSS) information is optional for the UE) • time stamp • serving cell ID • serving cell measurements • neighbor cell measurements <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 308 and 309.</p> <p>The following features are interrelated with the <i>LTE951: Enhanced Cell ID Location Service</i> feature:</p> <ul style="list-style-type: none"> • <i>LTE433: Cell Trace</i> The feature enables operators to simultaneously trace all UEs that are in an RRC_CONNECTED state in a target cell. • <i>LTE644: Configurable Cell Trace Content</i> The feature allows operators to select a message type, based on which the UEs that are in an RRC_CONNECTED state are filtered and traced in a target cell. • <i>LTE163: Subscriber and Equipment Trace</i> The feature enables operators to trace a specific IMSI or IMEI. • <i>LTE782: ANR Fully UE-based</i> Providing the <i>LTE782: ANR Fully UE-based</i> and <i>LTE951: Enhanced Cell ID Location Service</i> features are enabled, the location service measurement request takes higher priority than an ANR measurement. • <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> If the <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> and <i>LTE951: Enhanced Cell ID Location Service</i> features are enabled, the location service measurement request takes higher priority over the measurement requested by the <i>LTE1501: Measurement Report (MR) Addition to Cell Trace</i> feature. <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 66.</p>

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Claim 1	Corresponding Structure in Accused Systems		
	Function	Sub-function	Tools
	Tracing	Subscriber and equipment trace	NetAct TraceViewer
		Cell traffic trace	NetAct TraceViewer
		Trace-based, real-time monitoring	Traffica
		Sub-function and tool exclusive for LTE Radio Access	
		External interface trace	3rd party analyzer
<p>Attachment 16 (Monitoring and Measuring System in LTE RAN (2014)) at 9.</p> <p>The <i>Tracing</i> function in practice means collecting and analyzing trace records that are created for certain calls within a cell or for certain subscribers/equipment. The traced data can be viewed using the NetAct TraceViewer application. For information on the tracing area, see <i>Tracing LTE RAN System</i>. For information on the NetAct TraceViewer application, see <i>Tracing Principles</i> and <i>Tracing Subscribers and Equipment</i> documents in the NetAct documentation. With the introduction of LTE1340: Trace-based Real Time Monitoring feature, the data collected using the cell trace feature can be forwarded to Traffica for visualization. Traffica is a real-time traffic monitoring and analyzing tool that allows the operator to immediately detect network and service failures. Data forwarded to Traffica can be presented as a real time graph (using the Traffica Views client). It can also be stored for further analysis. For information on Traffica, see the <i>Traffica documentation</i>.</p>			

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Claim 1	Corresponding Structure in Accused Systems
	<p>Attachment 16 (Monitoring and Measuring System in LTE RAN (2014)) at 9.</p> <p>4.2.1 Management-based activation</p> <p>The cell traffic trace session is activated/deactivated using the management based-approach. The NetAct TraceViewer triggers the Configurator to generate a delta plan file and to download it to the managed eNBs. The cell trace session starts when the trace session instance (containing the trace parameters) is created.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 12.</p> <p>2.2 LTE433: Cell Trace</p> <p>With this feature it is possible to follow the connections ongoing in a cell and verify the intended functionalities within a cell. With the cell trace, all the UEs in a target cell that are in the connected state are traced simultaneously. It can be used for a deeper analysis if problems occur and when various performance measurements do not give a clear indication of the problem. For more details, see LTE433: Cell Trace.</p> <p>...</p> <p>2.5 LTE162: Cell Trace with IMSI</p> <p>With this feature, the existing cell trace data reports can be mapped with the IMSI/IMEI numbers of UEs located in the traced cell. This feature extends the scope of the LTE433: Cell Trace feature. The current <i>LTE433: Cell Trace</i> functionality remains unchanged. For more details, see LTE162: Cell Trace with IMSI.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<p>2.6 LTE953: MDT (Minimization of Drive Test)</p> <p>This feature is introduced as an alternative to expensive drive tests performed during network deployment and optimization. It offers a predefined set of MDT profiles available at the NetAct TraceViewer application. The profiles are defined to detect and monitor potential coverage problems. The solution is based on data that is collected using the following features:</p> <ul style="list-style-type: none"> • LTE433: Cell Trace • LTE644: Configurable cell trace content • LTE570: Periodic UE Measurements <p>For more details, see LTE953: MDT (Minimization of Drive Test).</p> <p>2.7 LTE1340: Trace-based Real Time Monitoring</p> <p>This feature introduces a real-time network monitoring solution that is based on:</p> <ul style="list-style-type: none"> • trace data collected from multiple eNBs • L3 Data Collector (L3DC) network element, which in terms of tracing acts as a trace collection entity • Traffica used for visualizing the collected data <p>For more details, see LTE1340: Trace-based Real Time Monitoring.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 8 and 9.</p>

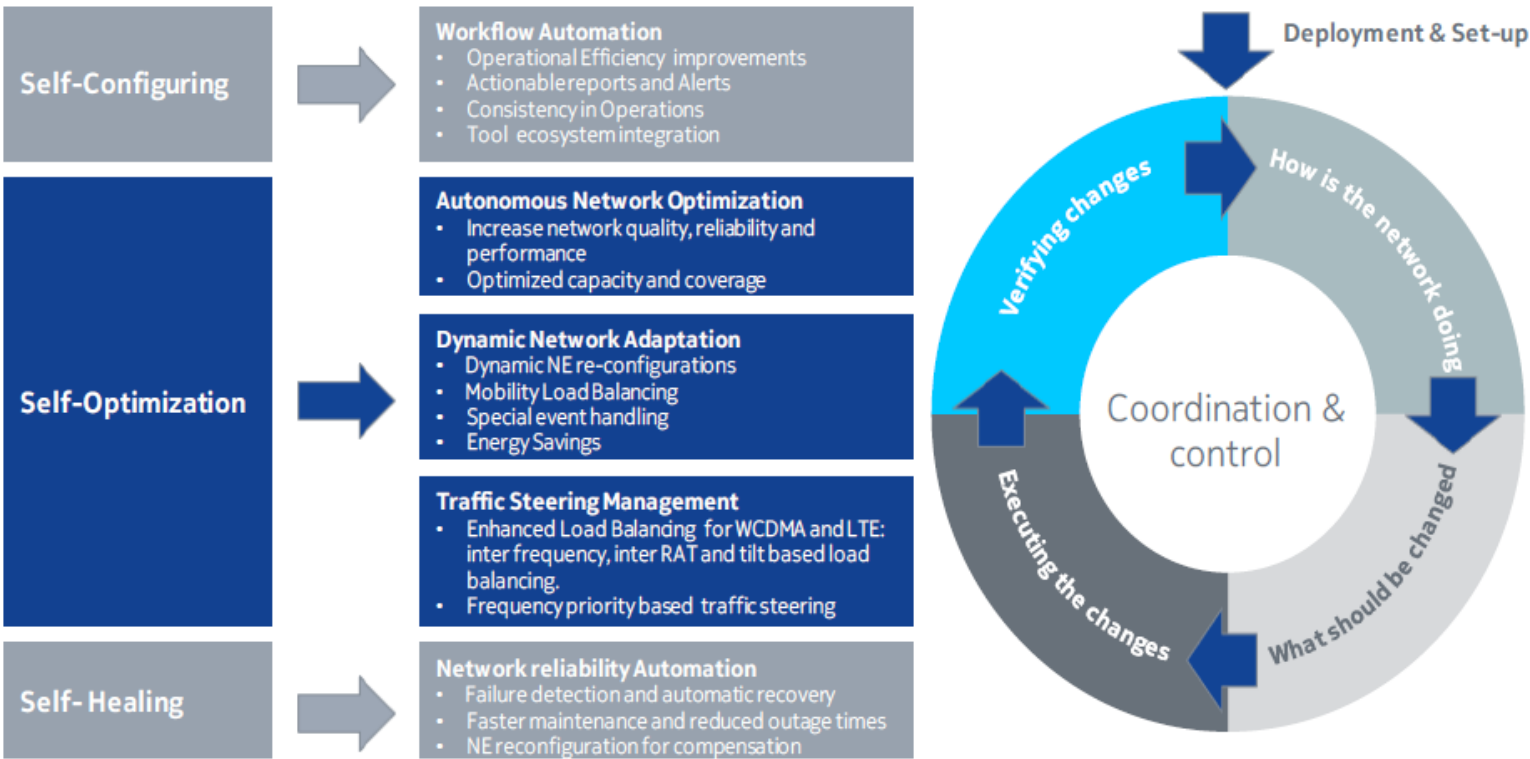
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<p>Introduction to LTE trace</p> <p>The LTE trace area consists of the subscriber, equipment trace, and the cell traffic trace, which are network-wide, system-level features. These features are useful for network system maintenance, troubleshooting, and optimization operations. The subscriber and equipment trace provides detailed subscriber-oriented information at a call-level on one or more mobile subscribers or equipment. This feature can be activated for one or more subscribers in the network, using the IMSI/IMEI(SV) number as the identifier. It is activated on user demand for a limited time. The subscriber and equipment trace data can be used to:</p> <ul style="list-style-type: none"> • check how different vendor's UEs are working together in the mobile network or to get detailed information on the observed UE. • check an UE which is not working correctly. • check the radio coverage in a particular network area. • get detailed information on a call-level for troubleshooting. • test the implementation of a new feature before its general deployment, for example, when performing a drive test in the area where the new feature is introduced. • get feedback on the network quality and capacity after optimization operations like the parameter fine-tuning or a network design. <p>The cell traffic trace provides detailed resource-oriented information at a call-level on a defined number of calls in one or more cells. This feature can be activated for specific cells without the UE identification. It is activated on user demand for a limited time. The cell traffic trace data can be used to:</p> <ul style="list-style-type: none"> • check the radio coverage in a particular network area, which helps to avoid drive tests. • get feedback on the network quality and capacity after optimization operations like the parameter fine-tuning or a network design, which helps to avoid drive tests. <p>Attachment 17 (Tracing LTE RAN System (2012)) at 7.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<div><h3>Trace architecture</h3><p>Figure 1 LTE trace architecture shows the architecture of the trace area.</p><p>The diagram illustrates the LTE trace architecture. It includes the following components and their interactions:</p><ul style="list-style-type: none">3rd party analyzer (yellow box): Receives trace reports from the Security gateway.NetAct TraceViewer (grey box): Receives management-based activation from the iOMS and sends signaling-based activation to the MME. It also receives trace reports from the iOMS.3rd party O&M (yellow box): Sends signaling-based activation to the MME.iOMS (grey box): Contains a Trace Data database. It receives management-based activation from the NetAct TraceViewer and sends trace reports to the NetAct TraceViewer.Security gateway (grey box): Receives management-based activation from the iOMS and sends trace reports to the 3rd party analyzer. It also receives signaling-based activation from the MME.eNB (grey box): Contains a Trace Data database. It receives management-based activation from the Security gateway and sends trace reports to the Security gateway. It also receives signaling-based activation from the MME.MME (orange triangle): Receives signaling-based activation from the 3rd party O&M and sends it to the Security gateway and eNB.<p>Legend:</p><ul style="list-style-type: none">Red arrow: Management-based activationGreen arrow: Signaling-based activationBlue arrow: Trace reports transfer<p>Figure 1 LTE trace architecture</p><p>Attachment 17 (Tracing LTE RAN System (2012)) at 10.</p></div>

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Claim 1	Corresponding Structure in Accused Systems
	<p style="text-align: center;">A new way of looking at Self-Organizing Networks (SON)</p>  <p>The diagram illustrates the structure and lifecycle of Self-Organizing Networks (SON). On the left, three main functional areas are listed: Self-Configuring, Self-Optimization, and Self-Healing. Self-Configuring leads to Workflow Automation (Operational Efficiency improvements, Actionable reports and Alerts, Consistency in Operations, Tool ecosystem integration). Self-Optimization leads to Autonomous Network Optimization (Increase network quality, reliability and performance, Optimized capacity and coverage), Dynamic Network Adaptation (Dynamic NE re-configurations, Mobility Load Balancing, Special event handling, Energy Savings), and Traffic Steering Management (Enhanced Load Balancing for WCDMA and LTE: inter frequency, inter RAT and tilt based load balancing, Frequency priority based traffic steering). Self-Healing leads to Network reliability Automation (Failure detection and automatic recovery, Faster maintenance and reduced outage times, NE reconfiguration for compensation). On the right, a circular lifecycle diagram shows the process: Deployment & Set-up leads to 'How is the network doing', which leads to 'What should be changed', then 'Executing the changes', then 'Verifying changes', which loops back to 'How is the network doing'. The center of the cycle is labeled 'Coordination & control'.</p> <p>Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 6.</p>

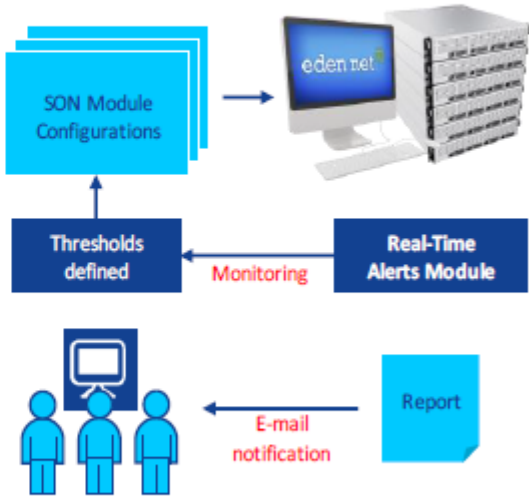
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Claim 1	Corresponding Structure in Accused Systems
	<div><div><div><div><h3>Eden-NET Centralized SON Server OSS Interfaces</h3><div><div><div><div><div>Configuration Management (CM)<ul style="list-style-type: none">CM data retrieved and pushed over CORBA interface</div><div>Performance Monitoring (PM) data<ul style="list-style-type: none">PM data retrieved via FTP, CORBA or via direct data base access for NetActOther vendor example - PM data retrieved via FTP for Ericsson OSS-RC</div><div>Event Data<ul style="list-style-type: none">NOKIA Megamon data retrieved via FTPOther vendor example - Ericsson GPEH data retrieved via FTP</div></div><div><div>Other supported interfaces: Direct to Database, SOAP and XML</div><div>Vendor-specific software drivers are needed to integrate new system</div></div></div><div><div><div>Network LTE, WCDMA, GSM</div><div><div><div>Another Vendor OSS</div><div><div>CM</div><div>PM</div><div>Events</div></div><div><div>CORBA</div><div>FTP</div><div>FTP</div></div><div>CM Data</div><div>PM Data</div><div>Event Data</div><div>Vendor-specific drivers</div><div>Eden-NET</div><div>Vendor-specific drivers</div><div>CM Data</div><div>PM Data</div><div>Event Data</div><div><div>CORBA</div><div>Direct to Database / FTP</div><div>CORBA</div><div>FTP</div></div><div>CM</div><div>PM</div><div>Events</div><div>NOKIA NetAct OSS</div></div><div><div>Itf-N interface</div><div>Itf-N interface</div></div></div></div></div></div></div><div><div>13</div><div>Nokia Internal Use</div><div>OS8461-16A-NRM</div><div>© Nokia 2017</div><div>NOKIA</div></div><p>Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 12.</p></div></div></div></div>

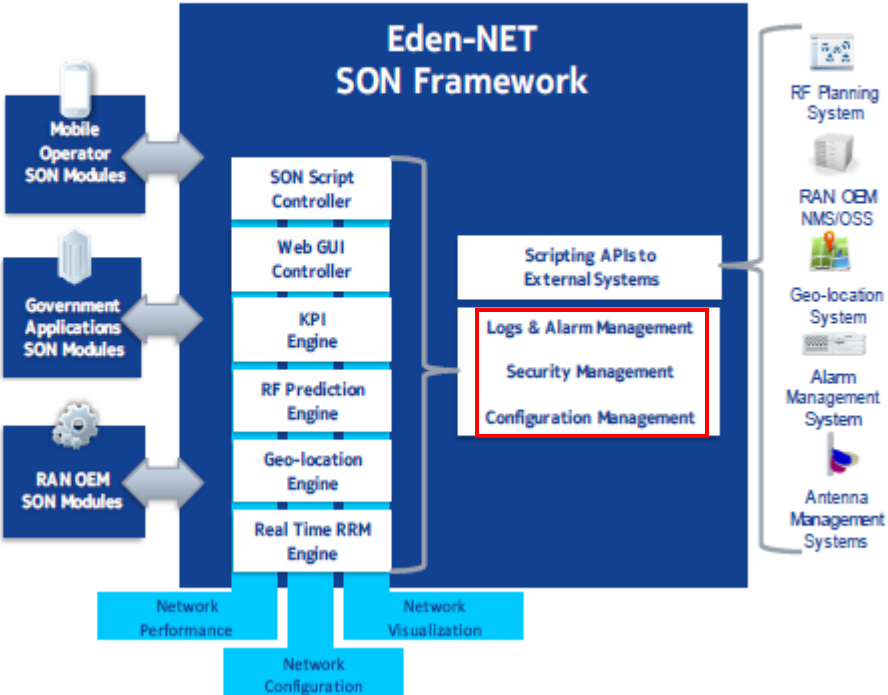
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<p data-bbox="394 248 947 293">Workflow Automation Modules</p> <p data-bbox="394 302 688 347">Real Time Alerts</p> <p data-bbox="394 394 552 427">Overview:</p> <ul data-bbox="394 443 1787 621" style="list-style-type: none"> • This module allows the users to evaluate specific KPIs for a set of target cells based on a set of predefined thresholds. • The module will monitor the KPIs in the network against the pre-defined threshold, prepare report and notify the user via email about worst performing area. <p data-bbox="394 646 422 662">...</p> <p data-bbox="394 670 1808 751">When a SON module is configured in Eden-NET, thresholds also need to be defined. The module that is in charge of watching the thresholds is called 'Real-Time Alerts'.</p> <p data-bbox="394 760 1839 841">The Real-Time Alerts module monitors all the KPIs in the GSM, WCDMA, and LTE networks against the thresholds definitions.</p> <p data-bbox="394 849 1770 930">When any KPI breaches its threshold, this module generates a report and notifies the user via email about the worst performing areas.</p> <p data-bbox="380 938 1335 979">Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 51.</p>

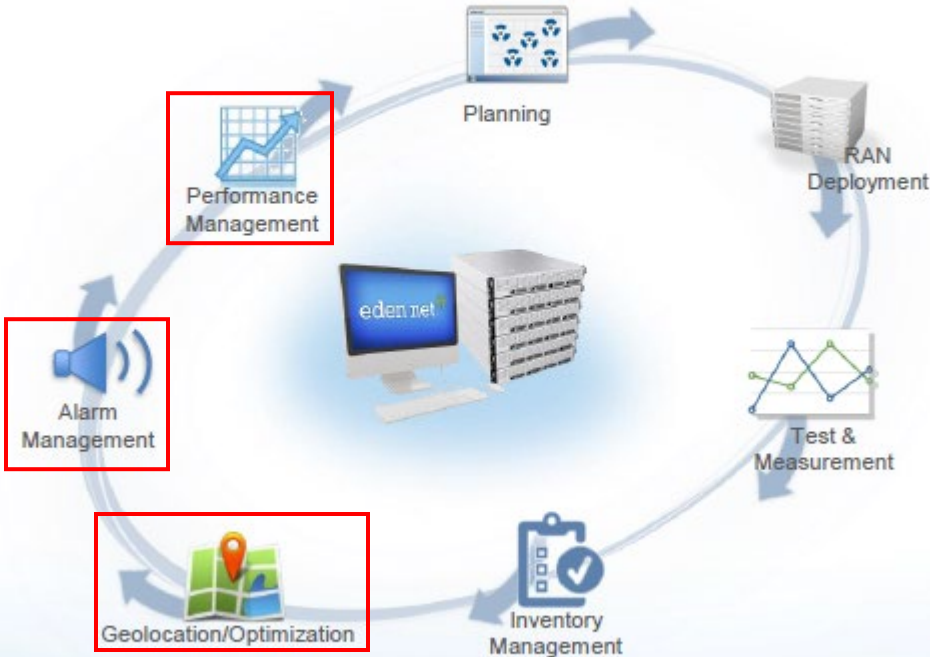
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Claim 1	Corresponding Structure in Accused Systems
	<p>Workflow Automation Modules</p> <p>Real Time Alerts</p> <div data-bbox="394 367 1234 1039"> <p>Description</p> <ul style="list-style-type: none"> • Monitor the KPIs in the network against the pre-defined threshold and prepares a report. • Supports 2G, 3G and LTE KPIs • Daily email report is sent to the RF engineers. <p>Benefits</p> <p>Immediate indications to operators when the monitored KPIs cross defined thresholds. A powerful tool to monitor the performance of the network in real.</p> </div>  <p>Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 52.</p>

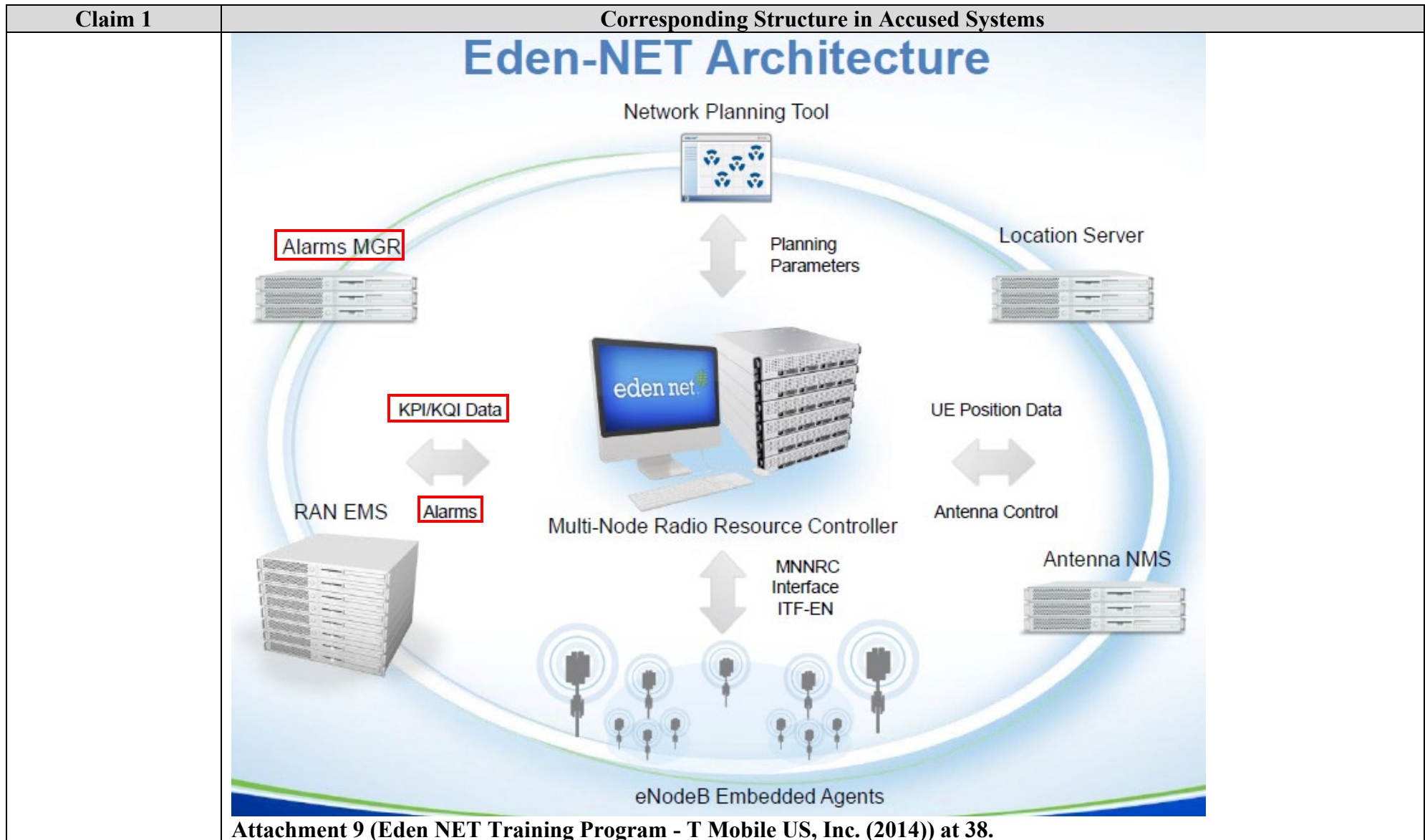
INFRINGEMENT CONTENTIONS
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Claim 1	Corresponding Structure in Accused Systems
	<p>SON Framework</p>  <p>...</p> <p>The SON Framework serves the function of operating system for SON that makes easy to the Operators to manage and enable the individual SON modules. The SON Framework interacts with external systems such as OSS/NMS systems, antenna management systems, RF Planning systems, and Alarm Management systems. The scripting framework includes software API's to interface with these external systems.</p> <p>Attachment 10 (NokiaEDU Eden-NET Overview Course (2017)) at 11.</p>

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Claim 1	Corresponding Structure in Accused Systems
	<div data-bbox="380 240 1770 1252"> <p style="text-align: center;">SON is Essential for Mobile Operators</p> <p style="text-align: center;">Robust SON solutions address the full portfolio of management tools that carriers need.</p>  <p style="text-align: center;">The platform of SON automates data exchange between each tool/function.</p> </div> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 24.</p>

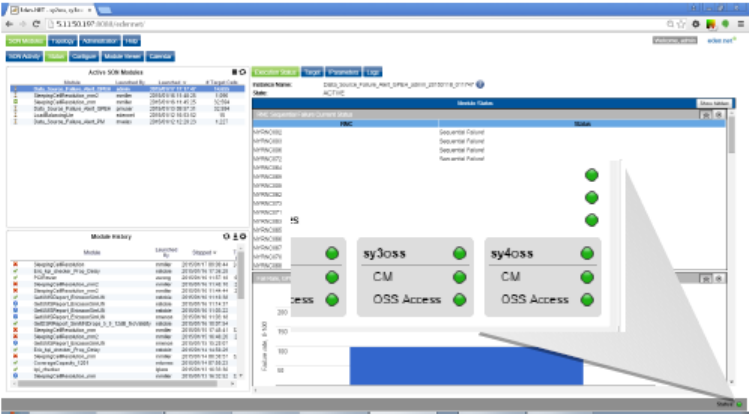
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Claim 1	Corresponding Structure in Accused Systems																																																																																																																															
	<h2>Eden-NET® SON Modules</h2> <p>Deployed at Scale and Delivering the Industry's Best Results.</p> <div><table><tr><th>SON Module</th><th>2G</th><th>3G</th><th>4G</th></tr><tr><td>Automatic Performance Reports</td><td>†</td><td>†</td><td>†</td></tr><tr><td>Real-Time Alerts</td><td>†</td><td>†</td><td>†</td></tr><tr><td>Parameter Consistency Enforcement (PCE)</td><td>†</td><td>†</td><td>†</td></tr><tr><td>Automatic Neighbor Relation (ANR)</td><td>†</td><td>†</td><td>†</td></tr><tr><td>Layer Management Strategy (LMS)</td><td>†</td><td>†</td><td>†</td></tr><tr><td>Reuse Code Optimization (RCO)</td><td>Q3</td><td>†</td><td>†</td></tr><tr><td>Coverage & Capacity Optimization (CCO)</td><td>N/A</td><td>†</td><td>†</td></tr><tr><td>Mobility Load Balancing (MLB)</td><td>N/A</td><td>†</td><td>†</td></tr><tr><td>Crossed Antenna Detection</td><td>†</td><td>†</td><td>†</td></tr><tr><td>Plug & Play</td><td>N/A</td><td>†</td><td>†</td></tr><tr><td>Mobility Robustness Optimization (MRO)</td><td>N/A</td><td>Q1 '16</td><td>Q3</td></tr><tr><td>Sleeping Cell</td><td>N/A</td><td>†</td><td>Q3</td></tr><tr><td>Automatic Parameter Optimization (APO)</td><td>Q4</td><td>Q4</td><td>Q4</td></tr><tr><td>Cell Outage Compensation</td><td>N/A</td><td>Q4</td><td>Q3</td></tr><tr><td>Special Event</td><td>Q4</td><td>Q4</td><td>Q4</td></tr></table><table><tr><th>SON Module</th><th>2G</th><th>3G</th><th>4G</th></tr><tr><td>Hotspot Identification</td><td>N/A</td><td>Q1 '16</td><td>Q1 '16</td></tr><tr><td>Enhanced Mobility Load Balancing (MLB)</td><td>N/A</td><td>Q1 '16</td><td>Q1 '16</td></tr><tr><td>Green Networks</td><td>Q1 '16</td><td>Q1 '16</td><td>Q1 '16</td></tr><tr><td>RACH Parameter Optimization</td><td>N/A</td><td>'16</td><td>Q4</td></tr><tr><td>Enhanced Plug & Play</td><td>N/A</td><td>N/A</td><td>Q1 '16</td></tr><tr><td>Spectrum Clearing</td><td>'16</td><td>N/A</td><td>N/A</td></tr><tr><td>Carrier Aggregation Optimization</td><td>N/A</td><td>N/A</td><td>'16</td></tr><tr><td>VoLTE Optimization</td><td>N/A</td><td>N/A</td><td>'16</td></tr><tr><td>Data Correlation</td><td>N/A</td><td>'16</td><td>'16</td></tr><tr><td>Tracking Area Optimization</td><td>N/A</td><td>N/A</td><td>'16</td></tr><tr><td>eICIC Optimization</td><td>N/A</td><td>N/A</td><td>'16</td></tr><tr><td>MIMO Optimization</td><td>N/A</td><td>N/A</td><td>'16</td></tr><tr><td>Uplink Noise Optimization</td><td>N/A</td><td>'16</td><td>N/A</td></tr><tr><td>CoMP Reporting</td><td>N/A</td><td>N/A</td><td>'16</td></tr></table><div>NOKIA</div></div>				SON Module	2G	3G	4G	Automatic Performance Reports	†	†	†	Real-Time Alerts	†	†	†	Parameter Consistency Enforcement (PCE)	†	†	†	Automatic Neighbor Relation (ANR)	†	†	†	Layer Management Strategy (LMS)	†	†	†	Reuse Code Optimization (RCO)	Q3	†	†	Coverage & Capacity Optimization (CCO)	N/A	†	†	Mobility Load Balancing (MLB)	N/A	†	†	Crossed Antenna Detection	†	†	†	Plug & Play	N/A	†	†	Mobility Robustness Optimization (MRO)	N/A	Q1 '16	Q3	Sleeping Cell	N/A	†	Q3	Automatic Parameter Optimization (APO)	Q4	Q4	Q4	Cell Outage Compensation	N/A	Q4	Q3	Special Event	Q4	Q4	Q4	SON Module	2G	3G	4G	Hotspot Identification	N/A	Q1 '16	Q1 '16	Enhanced Mobility Load Balancing (MLB)	N/A	Q1 '16	Q1 '16	Green Networks	Q1 '16	Q1 '16	Q1 '16	RACH Parameter Optimization	N/A	'16	Q4	Enhanced Plug & Play	N/A	N/A	Q1 '16	Spectrum Clearing	'16	N/A	N/A	Carrier Aggregation Optimization	N/A	N/A	'16	VoLTE Optimization	N/A	N/A	'16	Data Correlation	N/A	'16	'16	Tracking Area Optimization	N/A	N/A	'16	eICIC Optimization	N/A	N/A	'16	MIMO Optimization	N/A	N/A	'16	Uplink Noise Optimization	N/A	'16	N/A	CoMP Reporting	N/A	N/A	'16
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CoMP Reporting	N/A	N/A	'16																																																																																																																													
	Attachment 19 (Eden-Net with iSON Manager (2015)) at 7.																																																																																																																															

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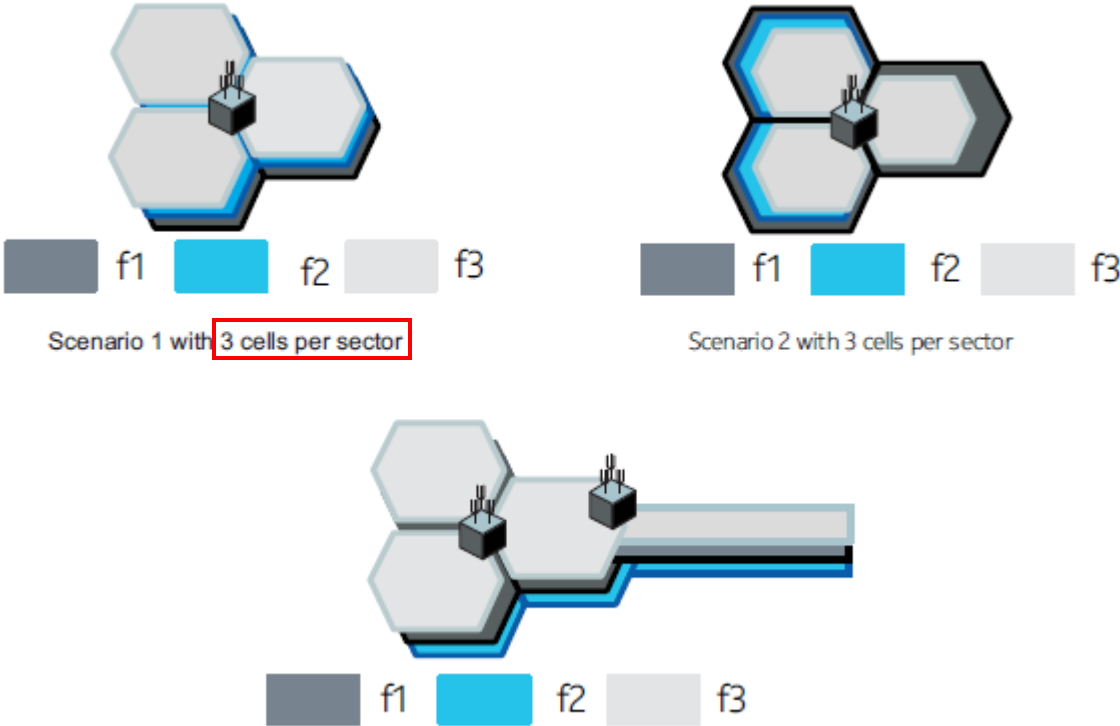
Claim 1	Corresponding Structure in Accused Systems																								
	<div><div><div>Nokia Eden-NET<ul style="list-style-type: none">IT System Integrations.</div><table><thead><tr><th>IT System</th><th>Availability</th></tr></thead><tbody><tr><td>PM</td><td>↑</td></tr><tr><td>CM</td><td>↑</td></tr><tr><td>Call Trace</td><td>↑</td></tr><tr><td>Subscriber Geolocation</td><td>Q4 '15</td></tr><tr><td>FM</td><td>Q3 '15</td></tr><tr><td>Big Data Systems</td><td>'16</td></tr><tr><td>Trouble Ticket and Work Order Systems</td><td>'16</td></tr><tr><td>Inventory management systems</td><td>'16</td></tr><tr><td>MME OSS: PM, CM Integration</td><td>'16</td></tr><tr><td>CEM</td><td>'16</td></tr><tr><td>Drive Test and 3rd Party Probe</td><td>'17</td></tr></tbody></table></div><div><p>The SON Adapter Layer provides a well-structured extensible abstraction layer for interfacing with external systems.</p></div></div>	IT System	Availability	PM	↑	CM	↑	Call Trace	↑	Subscriber Geolocation	Q4 '15	FM	Q3 '15	Big Data Systems	'16	Trouble Ticket and Work Order Systems	'16	Inventory management systems	'16	MME OSS: PM, CM Integration	'16	CEM	'16	Drive Test and 3 rd Party Probe	'17
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	<div data-bbox="388 313 1165 350"> <h2>Nokia Eden-NET®</h2> <p>State of the art visualisation capabilities</p> </div> <div data-bbox="388 389 888 428"> <h3>Advanced MAP visualisation</h3> <ul style="list-style-type: none"> • Visualisation of KPIs, based on KPI ranges • Visualisation of cell status • Visualisation of propagation delay. • Polygon support. • Advanced filtering options on map </div> <div data-bbox="388 467 783 505"> <h3>KPI trend visualisation</h3> <ul style="list-style-type: none"> • Visualisation of KPI in different forms (graphs, tables) </div> <div data-bbox="1178 370 2007 841"> <p>The screenshot displays the Nokia Eden-NET web interface. On the left, there's a sidebar with 'Map Views' and 'Selected Clusters'. The main area shows a map with various colored overlays representing different KPIs. On the right, there are 'KPI Information' panels showing line graphs for 'Percentage of 3G Voice Calls' and 'Percentage of 3G Voice Call' over time. A red box highlights a specific cluster on the map, and a tooltip shows details for 'Cluster: U7WDC190A31'.</p> </div>

Attachment 19 (Eden-Net with iSON Manager (2015)) at 12.

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	<p><i>Figure 9</i> Examples of three-cell CA</p>  <p>Scenario 1 with 3 cells per sector</p> <p>Scenario 2 with 3 cells per sector</p> <p>Scenario 1 or 2 with 3 cells per sector (with non-wireless repeater)</p> <p>Attachment 14 (FDD-LTE15A, Feature Descriptions and Instructions (2015)) at 151.</p>

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	<p>Optimization Use Cases</p> <p>[O01] Radio Parameter Optimization: Neighbor cell list optimization</p> <p>[O02] Radio Parameter Optimization: Interference Control</p> <p>[O03] Radio Parameter Optimization: HO parameterization optimization</p> <p>[O04] Radio Parameter Optimization: QoS related parameter optimization</p> <p>[O05] Radio Parameter Optimization: Optimization Scenarios with Home BS/Pico BS</p> <p>[O06] Transport Parameter Optimization: Routing Optimization</p> <p>[O07] Transport Parameter Optimization: Optimization Scenarios with Home BS/Pico BS</p> <p>[O08] Reduction of Energy Consumption</p> <p>[ERO01] Capacity Optimization (Congestion Prime)</p> <p>Maintenance Use Cases</p> <p>[Ops01] Hardware / Capacity extension (Easy plug and play hardware replacement)</p> <p>[Ops02] Autonomous Inventory</p> <p>[Ops03] Automatic SW Download to Base Station</p> <p>[Ops04] Automated NEM upgrade</p> <p>[Ops05] Cell outage detection</p> <p>[Ops06] Performance Management in real time</p> <p>[Ops07] Direct KPI reporting in real time</p> <p>[Ops08] Information Correlation for Fault Management</p> <p>[Ops09] Subscriber and Equipment trace</p> <p>[Ops10] Cell Outage Compensation</p> <p>[Ops11] Compensation for Outage of higher level network elements (ASN GW)</p> <p>[Ops12] Fast recovery on instable NEM system</p> <p>[Ops13] Mitigation of outage of units</p> <p>[EROps01] System Availability</p> <p>Attachment 9 (Eden NET Training Program - T Mobile US, Inc. (2014)) at 10.</p> <p>4.5 Reporting types</p> <p>There are two basic types of trace data reporting:</p> <ul style="list-style-type: none"> • online-based • file-based <p>The trace reporting mode can be set for all trace sessions of the same trace type (subscriber trace, cell traffic trace) within one NE. That means, for example, that once the trace reporting mode for subscriber trace is set to <i>online trace reporting</i>, the trace reports for all subscriber trace sessions from a particular NE will be sent online. For trace data reporting to an external IP address, only the online-based reporting is applied, even if the trace reporting mode is set to <i>file based</i> for this NE.</p>

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	<p>4.5.1 Online-based reporting</p> <p>The trace reports are generated for each trace session periodically. This means that each trace report may contain several trace records of the same trace session. The iOMS is responsible for forwarding the trace reports to NetAct TraceViewer as NWI3 observation event reports. The TraceViewer supports online evaluation and presentation of the trace results.</p> <p>For online trace reporting, the trace data can be sent to NetAct or to an external IP address.</p> <p>4.5.2 File-based reporting</p> <p>The trace records are stored in trace log files, which are stored in iOMS. They are uploaded to NetAct TraceViewer at the end of each trace session or if the maximum file size is reached.</p> <p>For subscriber and equipment trace, one trace log file is generated for each traced subscriber and trace session. All trace records from same subscriber in same trace session are stored in the same trace log file.</p> <p>For cell traffic trace, one trace log file is generated for each traced cell and each trace session. All trace records of all traced connection within the same trace session are stored in the same trace log file. To avoid sending big trace log files, a maximum file size is defined. If the maximum file size is reached, the iOMS closes the trace log file and generates a new one for trace records storage. At the end of trace session or in case the maximum file size is reached, the iOMS triggers the NetAct TraceViewer (using the NWI3 FilesReadyEvent message) to upload the trace log files.</p> <p>Attachment 17 (Tracing LTE RAN System (2012)) at 18.</p>

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	<p>Subscriber and UE Trace is part of the optimisation process. Trace data are used to get feedback on the network quality and capacity after optimisation operations like parameter fine-tuning, or new network design. Each intervention to improve the network behaviour can be confirmed both by measurement data and Trace data.</p> <p>This study is started following an initiative from the operator.</p> <p>The operator can perform a drive test on the area and/or activate a Cell Traffic Trace where the optimisation has been performed, and check its good behaviour as well as its impact on the network. He can also rely on subscribers' Trace data when they use the network to be optimised.</p> <p>Attachment 11 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements (3GPP TS 32.421 version 10.6.0 Release 10) (2013)) at 30.</p> <p>The high level requirements for Trace Data reporting, common to both Management activation/deactivation and Signalling Based Activation/Deactivation, are as follows (Trace record contents, file formats and file transfer mechanisms are defined in 3GPP TS 32.423 [3]):</p> <ul style="list-style-type: none"> - Trace records should be generated in each NE where a Trace Session has been activated and a Trace Recording Session has been started. - Format of the Trace records sent over Itf-N shall be XML based on the Schema in TS 32.423 [3]. - Trace records should be transferred on the Itf-N to the Network Manager using one of two approaches: direct transfer from NE to NM or transfer from NE to NM via EM. - Trace records may also be transferred to an external IP address (received in Trace Control and Configuration Parameters) in 3 ways: <ol style="list-style-type: none"> 1. Direct transfer from NE to IP address 2. Transfer from NE to IP address via EM 3. Transfer from NE to EM. The EM notifies the holder of the IP address that collects the files. <p>For transfer of Trace records via Itf-N, FTP or secure FTP shall be used.</p> <p>Attachment 11 (Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements</p>

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	(3GPP TS 32.421 version 10.6.0 Release 10) (2013)) at 22.